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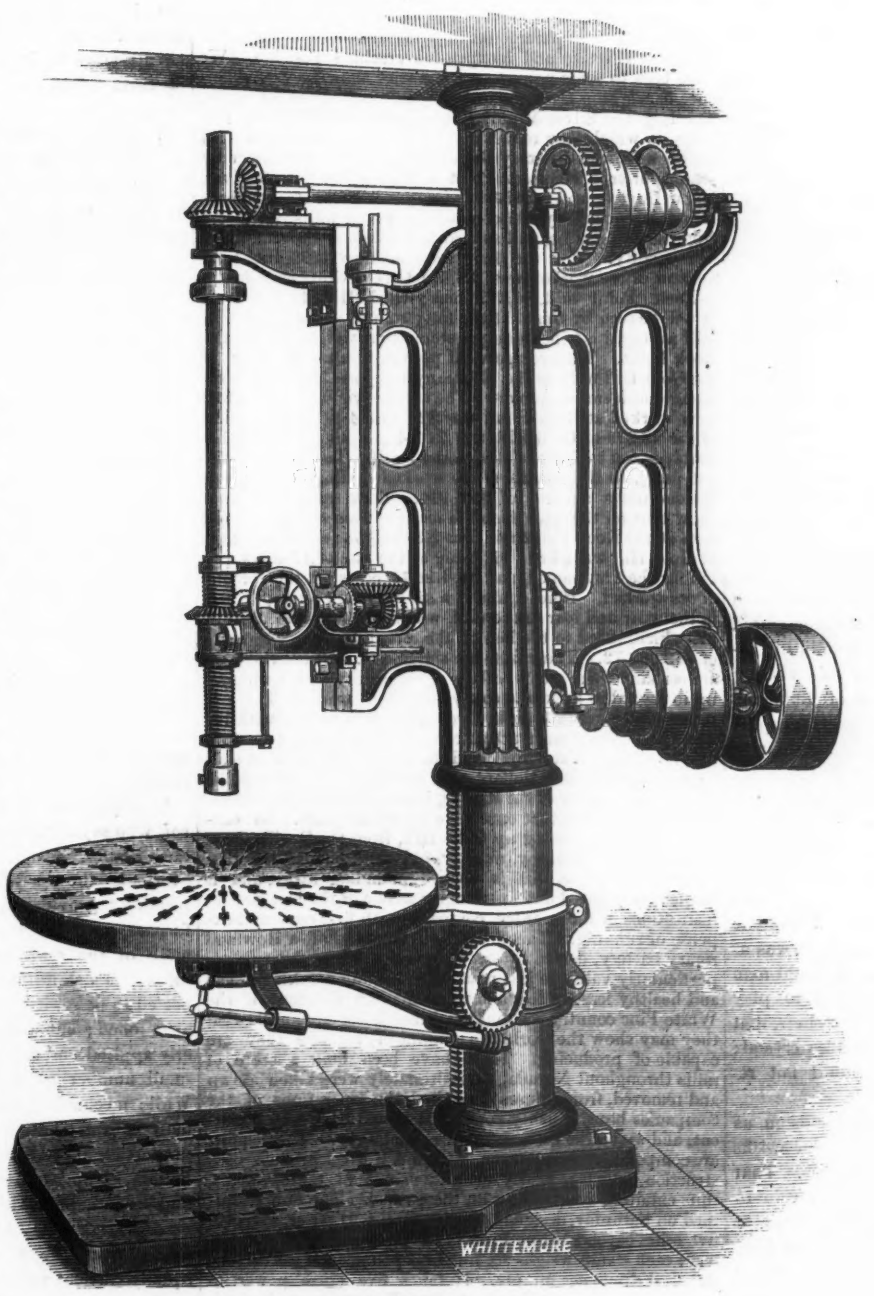
RAILROAD DRILL.

Our illustration this week represents the new Railroad Drill manufactured by L. W. POND, whose salesrooms are at 98 Liberty street, this city. This drill is self-feeding, drills to centre of four feet diameter, and admits of six feet under spindle. The machne weighs two tons, is substantially built, and finished in a superior manner. Our engraving sufficiently explains all its details.



POND'S RAILROAD DRILL

FOR THE AMERICAN JOURNAL OF MINING.

UNDERGROUND.

FROM "HENRY OF OFTERDINGEN," AN UNFINISHED NOVEL, BY NOVALIS.

TRANSLATED FROM THE GERMAN, BY BENJAMIN SMITH LYMAN.

[FRIEDRICH VON HARDENBERG studied mining at Freiberg, in Saxony, in 1798; and died in 1801, not quite twenty-nine years old, but already much admired as a poet, under the name of NOVALIS.]

I.

After some days' travel they came to a village at the foot of a peaked hill that was broken up by deep hollows. The country was fruitful too and pleasant, although the tops of the hills had a dead, forbidding look. The inn was neat, the servants were ready and willing, and a number of men, partly travellers, partly guests who had come merely to drink, sat in the room and chatted on all sorts of things.

Our travellers mixed with them and joined in their talk. The notice of the company was drawn, above all, to an old man who sat in foreign garb at a table and answered good-naturedly the questions that the prying put him. He came from foreign parts, had that morning made a careful search through the neighboring country, and was now telling about his trade and his discoveries of the day. The servants called him a treasure digger. But he spoke very modestly of his knowledge and power, although what he said bore the stamp of strangeness and novelty. He said he had been born in Bohemia. From his youth up he had felt an eager longing to learn what was hidden inside of the mountains, and know where the water in the springs came from, and where were found gold and silver and the precious stones that draw men so to to themselves in spite of everything. He had often looked in the neighboring cloister church at the fixed lights, on the pictures and shrines, and only wished that they could talk to him, so as to tell him of their mysterious source. He had sometimes heard that they came from far-off countries; but he had always wondered why there should not be such treasures and jewels in his own neighborhood. Surely the mountains were not for nothing, so large and lofty and so strongly barred; it had seemed to him too as if he had sometimes found shining and glittering stones on the mountains. He had clambered about busily among the cliffs and caverns, and had looked around him with unspeakable pleasure in these most ancient halls and vaults. At length there fell in with him a traveller, who told him he ought to become a miner, and then he could satisfy his thirst for knowledge; that there were mines in Bohemia; that he had only to go right down the river; that after ten or twelve days he would be in Eula; and that there he had only to say that he would like to become a miner. He did not need to be told that twice, and he set out the very next day.

After a tiresome walk of several days, he went on to say, I came to Eula. I cannot tell you how gloriously I felt when from a hill I caught sight of the heaps of stones, that were grown over with green bushes and had wooden buildings upon them; and when I saw the clouds of smoke rise over the woods out of the valley below. A far-off noise still further raised my hopes, and with more wonder than you can believe, and full of silent devoutness, I stood soon on such a heap (which they call a tip heap) before the dark depths that inside of the buildings led down into the hill. I hurried to the valley and soon met some men with lamps and clothed in black, whom I rightly took for miners; and with shy uneasiness made my wishes known to them. They listened to me good naturedly, and told me just to go to the smelting furnaces further down, and ask for the captain, for so they call their leader and master; he would let me know if I could be given a place. They said that I should likely get my wish easily; and they taught me the common greeting; "Good luck!"* with which I should address the captain. Full of happy hopes I went on my way, and could not make an end of saying over to myself this greeting so full of meaning. I found a venerable old man, who welcomed me with great friendliness; and after I had told my story, and had let him know how great a mind I had to learn his strange, mysterious art, he readily promised to grant my wish. I seemed to please him, and he took me into his house. I could hardly wait for the morrow, when I was to go into the mine and see myself in the charming garb. That very evening he brought me some mine clothes, and showed me the way to use some tools that lay stored away in a chamber.

In the evening some miners came to see him, and I lost not a word of what they said, however strange to me and beyond my understanding were both the words and the greater part of the matter of their talk. Still the little that I thought I took in added to the liveliness of my wish to know more, and kept me busy at night with strange dreams. I awoke betimes, and went to my new host, around whom one by one the miners gathered together to take his orders A room close by had been made into a little chapel. A monk came in and read a mass, and after that made a solemn prayer, in which he called on heaven to take the miners in his holy keeping; uphold them in their dangerous work, to guard them from the attacks and wiles of evil spirits, and to grant to them that they might strike rich veins. I had never prayed with more warmth and had never taken in the high meaning of the mass in a livelier way. My future comrades seemed to me heroes of the nether world, who had to overcome a thousand dangers, but had at the same time a most enviable lot with their wonderful knowledge, and in their earnest, silent fellowship with the rock sons of nature became fitted to have heavenly gifts and to be lifted up with joy above the world and its griefs.

After worship was over, the captain gave me a lamp and a little wooden crucifix, and went with me to the shaft, as we call the steep entrance into the underground workings. He taught me the art of going down, told me the needful rules of foresight, as well as the names of the manifold things and their parts. He went on in front, and slid down on the round beam, while he held with one hand to a rope that slid along with a loop on a side rail, and in the other hand carried the lighted lamp. I followed his leading, and we soon reached with good speed a pretty great depth in that way. I was strangely awestruck, and the front light twinkled like a lucky star that showed me the way to the hidden treasury of nature. We came at the bottom into a labyrinth of galleries, and my good natured master was never tired of answering my prying questions, nor of telling me about his art.

The rushing of the water, the distance of the surface where men dwell, the darkness and crookedness of the galleries and the far-off noise of miners at work greatly delighted me, and I felt myself now with joy to have in full

* "Glueck auf!" The true meaning of this greeting is unknown even to many Germans. According to a very old account of it, the meaning would seem to be: "May you have the good *luck* to open *up* (*Glueck aufzuschliessen*) rich ore!" On the other hand, "Glueck zu!" was thought by the miners to have a bad meaning, namely: "May you have the *luck* to have the rich ore veins shut *to* (*zuzuschliessen*) against you!"—TRANSLATOR.

what had ever been my strongest wish. No one can unfold and set forth this fulfilling of an inborn wish, this wonderful joy in things that seem to be very closely tied up with our inmost being, with the business for which we have been called and fitted from our cradle. Perhaps they would have seemed to any body else common, unmeaning and disagreeable; but to me they seemed as needful as air to the lungs or food to the stomach.

My old master was pleased with my hearty enjoyment, and promised me that by working so busily and so carefully I should get on well and become a skilful miner. With what devoutness did I see for the first time in my life on the sixteenth of March, forty-five years ago, the king of metals in fine leaves between the joints of the rock. It seemed to me as if he were shut up here in a strong prison and beamed kindly on the miner who had with such great dangers and hardships broken his way through the strong walls to him, so as to bring him out to the light of day, that he might come to honor on royal crowns and vessels and holy relics, and might, in valued and well guarded coins, adorned with likenesses, rule and guide the world. From that time I stayed in Eula, and rose step by step to be a cutter (that is, the real miner who works in the rock), after I had been set, to start with, at carrying out in baskets the loosened lumps of ore.

The old miner rested a little from his account, and took some drink, while his watchful listeners gave him a cheerful "Good luck." The words of the old man rejoiced Henry very greatly, and he felt very much like hearing more from him.

The listeners talked with each other of the dangers and wonders of mining, and recounted strange tales, at which the old man often smiled, and good naturedly took the pains to set them right in their odd notions.

After a while Henry said: You have likely since that seen and undergone many strange things; it is to be hoped that you have never been sorry for the life you chose? Would you be so kind as to tell us how it has gone with you since then, and on what journey you are now engaged? It seems as if you had looked about a good deal in the world, and I can see plainly that you are now something more than a common miner.

It pleases me well too, said the old man, to recall the times gone by; I find in them reasons for rejoicing in the mercy and goodness of God. Fate has led me through a happy and cheerful life, and not a day has passed that I have not laid myself to rest with a thankful heart. I have always been lucky in my affairs, and our Father in heaven has shielded me from the evil one, and let me grow gray in honors. Next to him I have to thank my old master, who has long since been gathered to his fathers, and on whom I can never think without tears. He was a man of the olden time, after God's own heart. He was gifted with deep insight, and yet childlike and humble in his behavior. Through him mining came into a very flourishing state, and brought vast wealth to the Duke of Bohemia. The whole country became by that means well peopled and thriving, and is now a blooming land. The miners all honor him as a father, and as long as Eula stands, his name will be spoken only with feeling and thankfulness. He was by birth a Lausitzer, and his name was Werner. His only daughter was still a child when I came to the house. My industry, my faithfulness and my warm attachment to him won his love for me more and more every day. He gave me his name and made me his son. The little girl grew up a cheerful, lively creature, whose face was as pleasantly smooth and white as her nature. The old man said to me often, when he saw that I was glad to play with her and could not keep my eyes off from hers, that were as blue and open as the sky, and shone like crystal; he said, that if I became a good miner, he would not refuse her to me; and he kept his word.

The day that I became a cutter, he laid his hands on us and blest us as a betrothed couple, and within a few weeks after that I led her as my wife up to my chamber. That same day that I became a cutter, I struck a rich vein in the morning shift, while still a cutter's apprentice, just at sunrise. The duke sent me a golden chain with his likeness on a large coin, and promised me the place of my father in law. How happy I was when I could hang it on my bride's neck on the wedding day and every eye was turned upon her. Our old father lived to see several likely grandchildren, and the luck of his autumn was richer than he had looked for. He could end his shift with joy, and go out of the dark mine of this world, to rest in peace and wait for the great pay day.

Wholesome Meat.

Dr. Letheby, in his late Cantor lecture "On food," gives many interesting statements regarding the efforts made by ancient and modern governments to prevent the sale of unwholesome meat. During the last seven years the amount of meat seized by the Inspectors in the City of London has been 100 tons per annum. The practice is to condemn the flesh of animals infected with certain parasites, as measles, flukes, &c., and of animals suffering from fever or acute inflammatory infections, as rinderpest, pleuro-pneumonia, and the fever of parturition, and of animals emaciated by lingering disease, and those which have died from accident or from natural causes, as well as all meat tainted with physic, or in a high state of putrefaction. A little practice is required to distinguish meat of this description, but generally, he says, good meat has the following characters: 1. It is neither of a pale pink, nor of a deep purple tint, for the former is a sign of a disease, and the latter indicates that the animal has not been slaughtered, but has died with the blood in it, or has suffered from acute fever. 2. It has a marbled appearance from the ramifications of little veins of fat among the muscles. 3. It should be firm and elastic to the touch, and should scarcely moisten the fingers—bad meat being wet and sodden and flabby, with the fat looking like jelly or wet parchment. 4. It should have little or no odor, and the odor should not disagreeable, for diseased meat has a sickly, cadaverous smell, and sometimes a smell of physic. This is very discoverable when the meat is chopped up and well drenched with warm water. 5. It should not shrink or waste much in cooking. 6. It should not run to water or become very wet on standing a day or so, but should, on the contrary, dry on the surface. 7. When meat is dried at a temperature of 212° or thereabout, it should not lose more than from 70 to 74 per cent. of its weight, whereas bad meat will often lose as much as 80 per cent.

Quartz Mills.

The trial of a quartz-mill, built for the Grant District, White Pine, Nevada, was made on Saturday last at the Miners' Foundry. The mill was an eight-stamp Howland Rotary Battery, weighing as it stood, in full working trim, less than six tons. For those distant districts in the interior of Nevada, where timber and lumber are scarce and transportation expensive, it is of paramount importance to secure the lightest, most effective and inexpensive machine possible. We have been to some pains to get statistics showing the difference in working the same ores by different styles of mills. The Imperial Silver Mining Company at Gold Hill own two mills, in which they reduce all their ores. The Gold Hill mill is a Howland Rotary Battery of forty stamps, driven by steam-power. The Rock Point mill is on the Carson river, below Dayton, and consists of eighty stamps in straight batteries, propelled by water-power. These mills work ore from the same mine, and as near as possible of the same average quality. For the four years ending 1868, the total amount of ore worked was 188,591 tons, divided as follows:—Rock Point mill, 95,312 tons; Gold Hill, 43,279 tons. It will be seen by this that the forty stamps at the Gold Hill mill averaged a trifle more per stamp than did those in the Rock Point. The average yield per ton is also in favor of the Gold Hill mill, as the Company's reports for the term under consideration proves. The average yield of the 95,312 tons worked at Rock Point was $27 16 3-4 per ton, and that of the 43,279 at Gold Hill, $27 71 1-4 per ton, being 54 1-2 cents per ton in favor of the latter mill. The loss to the company, on the amount of ore worked at Rock Point, was the enormous amount of $51,944. These reports further show that for the same time the receipts from the sale of old iron at the Rock Point mill was $16,338 53; and from that at Gold Hill was $4,817 81, being at the rate of 17 cents per ton for the first named, and the last 11, cents on the amount of ore worked. Here, again, is a saving of six cents per ton in the wear and tear of the mill, which amounts to $5,718 27, which, added to the loss on the ore, makes an aggregate of $62,662 72. These facts are suggestive. Of one thing we are certain: there seems to be a more healthy tone springing up in regard to large and costly reduction works. The experience of Nevada is all in favor of medium works, with the simplest possible construction compatible with effectiveness. The Gould and Curry mill, and its adjuncts, it has been stated, cost one million dollars, and the passer-by, instead of hearing the clatter of the stamps, is surprised at the solitude and lack of bustle that once gave life to the place. In contrast to this, in passing up Gold Hill, from the Devil's Gate, there is a little, dumpy, ricketty, old mill, one of the first eercted in Washoe, that is always pounding away, and is frequently pointed out to strangers as one of the best paying institutions of the country, compared with first cost and expense of running. This pocket mill consists of a Howland rotary battery, driven by steam power. These lessons are particularly valuable just now, when mining is taking a new and healthy lease of life, and when the rich districts of the White Pine country are making demands for more mills, that they may show the world the amount of treasure they are capable of producing. There have been built a score of mills throughout Nevada, that ultimately were taken down and removed, from causes that, had the operations of the companies been properly conducted, would have been apparent, and saved the cost of erecting machinery. These mills are composed of many parts, with much wood in their construction, which is nearly or quite ruined in taking apart, thus entailing a heavy loss on the owners. The mill examined on Saturday, designed for the Grant District, seventy-five miles beyond White Pine, is an eight-stamp rotary battery; each stamp weighs six hundred pounds and makes one hundred drops per minute. It takes five horse power to run it, and when working up to its full capacity will crush from twelve to sixteen tons in twenty-four hours. The battery or mill is of cast iron, and made in three sections, resting upon and bolted firmly to each other, with a half-inch layer of wood between the sections, which has the effect of breaking the jar or motion that otherwise might have a tendency to loosen the joints. This construction also facilitates the transportation, by allowing the sections to be taken apart. The bottom section or mortar weighs 3,000 pounds. The total height of the the machine is about eight feet, and the propelling power is imparted by connections of bevel gear attached to the upright or centre column, about four feet above the bottom of the mortar. By this arrangement there is less friction and strain on the machinery than in the batteries of the Imperial mill. One feature that will recommend it to the use of prospectors is, that it is a complete mill in itself and can be set up in one day ready for work when once on the ground. The first cost is such that it comes within the reach of poor men, and hundreds of companies owning gold mines throughout California will be thus enabled to buy a mill to work their own ores, who are now dependent upon custom mills. Too much attention cannot be given the subject of improving our quartz machinery, and we shall always welcome any improvement that will have a tendency to save, however small, a portion of the precious metals now running to waste through the sluice-ways of our multitude of mills.—*San Francisco Herald.*

Practical Letters.

[WRITTEN FOR THE JOURNAL OF MINING.]

VENTILATION.

REPLY OF MR. HARDEN TO MR. ROTHWELL.

(CONCLUDED.)

By experiments made on the Guibal fan, it has been found a comparatively efficient and economical ventilator; and where fans have been last erected in England its construction has been preferred. Some of the old fans also have been provided with the shutter and expanding chimney. Yet one fails to see that, as a consequence, every other means applied, and hitherto found sufficient for this purpose, should not continue to be so. Maintaining that any one of the systems employed is the *only* efficient one, and the most economical under *all* circumstances, is a condemnation of the rest, which the evidence of practice does not support. The introduction of the Leuville, Nasmyth, Barlow, Struve and some other of the mechanical ventilators used in England dates twenty years back; and such an exclusive merit in either of them would not have been left undiscovered until to-day.

The assertion that the late explosion in the "Arley main" coal of one of the collieries at Wigan would have been "entirely prevented had the ventilation been effected by means of a good fan or air-pump," is unaccompanied by evidence; and the claim that, explosion not being prevented, "no stagnation, much less a reversal of the air current could have taken place," is open for much more doubt than our friend seems to recognize. The fact that flames were drawn into the upcast road, where, we are told, some persons standing near the furnace were burned, shows that the course taken by the explosion was towards the downcast shaft, and that it there exhausted itself; that the reversal of the air was a consequence, which would have taken place whatever the motive power, assuming the air to have been traveling at a velocity not greater than was convenient for working. No fan or air-pump with a power of resistance less than that created by the explosion could have prevented it. More probably either a fan or a pump would have been damaged and rendered useless by the force causing the sudden reversal. That the power of the heat generated by the explosion and maintaining the reversed current would have been much sooner overcome by a "good fan" than it could have been by the furnace, there is not the possibility of a doubt; but whether this could have been done soon enough to save the men found in the pony road, who appear to have perished in the after-damp there are many grave reasons to doubt.

In quoting a correspondent of the London *Mining Journal*, who says, "The ventilating furnace, in most instances of this kind, is a standing source of danger," our friend overlooks the qualification: and in the allusion to the seeming "providence, that the coal was not ignited by the furnace, and many more lives sacrificed," there appears more of the sentimental than the probable. Where the furnace *is* a standing source of danger, or reasonably suspected to be so, it is needless to say it ought to be at once abandoned; but that such is not the case where it is properly applied and suitable arrangements are made, the very small number of accidents traced to it bears testimony. While mechanical ventilation in its best form will be the most suitable appliance to many of the pits, yet, in a large proportion of the three to four thousand collieries of Great Britain, comprising, with the iron-stone mines, double that number of upcast shafts, practice will still find that, with air-courses of suitable area, and properly laid out, the furnace remains the most easily applied, economical, and equally efficient ventilator. And here let me repeat a conviction expressed in an early letter on the subject, that while such large areas of coal are worked by so few openings to the surface, no system of ventilation, with the present inventions of ventilators, or of lighting, will free us from the fearful calamities of which we yearly read.

Again taking leave of this discussion, I may express a hope that the copiousness of repetition, which to many of your readers will have appeared unnecessary and tedious, will not have been without its advantage to others. That "the sparks made to fly" have thrown some "light" upon the subject needs little further evidence than has already been furnished, though unavowed, in the modification and extension of the views of Mr. Rothwell himself.

J. W. H.

Something Worth Remembering.—When you promise to do a thing, be sure to keep your word, as well for the sake of truth as in justice to others.

Mining Summary.

GOLD AND SILVER.

Gleanings from Mr. Raymond's Report.

Nevada.

[THE COMSTOCK MINES—THEIR PRESENT CONDITION.

Frequent reports and descriptions contained in pamphlets and periodicals, and the voluminous evidence adduced in numerous litigations, together with the decisions of juges and juries, have given to all persons interested in mining a general notion of the topography and geology of the Washoe country, through which courses the Comstock lode; while the forthcoming work of Mr. Clarence King and his party will doubtless embody the results of patient and thorough scientific research into the details of the character of the vein. I do not know to what conclusion these gentlemen have come, as to the points discussed in this report; but while I willingly leave to them the task of description and discussion, I feel justified in putting forward with some confidence the following opinions as to the present condition and prospects of the mines, based partly upon my own observation, and partly upon the notes of Mr. Cæsar Luckhardt (author of a valuable paper on the concentration of ores, in the preliminary report of J. Ross Browne), a mining engineer, whose thorough familiarity with every foot of the Comstock entitles his views to the highest consideration. To explain the sequel I shall premise a partial statement of the

GENERAL CHARACTERISTICS OF THE VEIN.

The Comstock is situated in a heavy belt, consisting principally of metamorphic rocks, but trachyte occurs in many places in the immediate vicinity of the vein. It has a general north and south course and an easterly dip, and has been traced on the surface for more than 27,000 feet. Of this great length about 19,000 feet have been actually explored, and comprise the locations of the principal mines. The western boundary or footwall of the vein consist of a syenitic * rock, which is divided from the vein-matter by a seam of bluish-black crystaline rock, resembling aphanite, and locally termed "black dyke." The eastern boundary, or hanging wall, is not so well defined. For about 16,000 feet along the most developed † portion of the vein, it consists of a ferruginous felspathic porphyry, in various stages of decomposition, up to that of plastic clay; but both north and south of this it gradually gives place to diorite, and finally to a syenitic rock which can scarcely be distinguished from the foot-wall. The notion that the Comstock is a "contact vein," between two distinct formations, appears, therefore, to be an erroneous one. The width of the vein, as far as developed, may be said to average about 175 feet. Near the surface it was in places 1,100 feet; and in other parts, and especially the northern portion of the vein, the walls were found to come very close together—in miners' phrase the vein is "pinched." As the outcrop runs along the steep eastern slope of Mount Davidson, the vein appears, judging from the east wall, to dip under the mountain; and many of the early vertical shafts, sunk to pierce it in depth, were therefore located on the western side, while the true dip is to the east. The popular expression is, that the vein is "overborne" by the mountain and changes its dip near the surface; but this, like almost all the miners' terms in all countries, is the statement of the exact reverse of the truth ‡ The fact is that the eastern part of the surface, loosened by the formation of the Comstock fissure, slid or subsided, opening a wide gap, into which fragments of the country rock, always from the east, fell. These, acting as wedges, prevented the fissure from closing by the weight of the hanging wall, until it was filled with mineral. There is nothing abstruse in this explanation; but it must be borne in mind that neither the opening of the fissure, the movement of the country rock, nor the deposition of mineral matter were necessarily sudden and violent. Sir Charles Lyell has ably shown that in all probability the most stupendous geological disturbances have been the result of the slowest processes. The only sudden geological operations with which we are familiar are volcanic ones; and these are seldom connected with the immediate production of mineral deposits valuable to man.

The large masses of rock which fell into the fissure all came, as I have said, from the east wall; and this partly explains the irregularity of that wall, while it also produces the appearance of a variable dip, first west, then vertical, and finally east. There was much money lost by the early belief in a west dip, since expensive buildings and machinery were necessarily removed, when the truth was discovered, from the west to the east side of the vein, and much costly excavation was wasted. Whether the ore and gangue of the Comstock came from the east or west, or from immeasurable depths, I shall not discuss. It seems to me that the non-metalliferous portion of the vein matter, near the surface, has been affected more or less by the decomposition and re-crystallization of the constituents of the country rock. But I shall not pause to undertake a discussion for which I do not feel sufficiently prepared. Such suggestions as I may venture will be more appropriate in the sequel.

One very prominent feature in the Comstock is the occurrence of alternate metalliferous and unproductive courses of bodies of ore, imbedded in the matrix. The unproductive masses constitute by far the larger portion of the whole bulk of the vein. The productive masses (ore-chambers, chimneys, zones, bodies, bonanzas, or what not) are irregular in shape, with a general tendency to a lenticular form, giving a crescent in cross-section, something like a concavo-convex lens. They lie obliquely between the walls, generally originating near the foot-wall, and terminating somewhere in the vicinity of the hanging wall. They appear to be secondary in form to the local influences of the dikes or "horses" of the unproductive ground which separate them, and render them wider or narrower as the case may be. While most authorities now agree that the "one ledge theory," famous in the courts, is for all practical purposes the true one, and that the Comstock ledge includes all these bodies of ore, there is still no doubt that *within the limits of the original fissure* these deposits are in a certain sense separate. Doubtless the same thing occurs in many fissure veins; it is the vast proportions of this one which render it difficult to understand. Yet, after all, no small fissure vein could produce the same conditions. The very processes which here resulted in the deposition of independent bodies of ore might, in a similar vein, have produced a continuous "pay-streak," or central zone of ore. The Comstock was begun by nature on a vast scale; but the vehicle (whatever it was) that brought in the ore was not so much more abundant, as the receptacle was capacious, than in ordinary cases. To illustrate this argument (which is equally true, whatever be the hypothesis as to the method of filling the fissure), I will suppose that the gangue and ore were deposited from solution. This process often produces in narrow veins a banded structure. It can be observed in great perfection in many veins of Lander Hill, Reese River district, where there are alternate layers of gangue (quartz, manganese spar) and ore in the veins, parallel with the walls, and symmetrically arranged; showing, for instance, a band of quartz along either wall, then a band of spar, then in the middle of the vein a band of pay-streak or ore. The same vein may, however, have in one part a single central pay-streak, and in another wider part two pay-streaks with quartz between. The reason is obvious. If the entrance of metalliferous fluids was abundant enough to fill with its deposits all the space not already occupied by previous deposits of quartz or other gangue along the walls, then a single pay-streak was formed; but in a wider part of the same vein, the deposit of ore merely lined the sides of the fissure, and left room for a subsequent entrance and deposition of quartz. This gave the appearance of two pay-streaks, sometimes erroneously called a double vein.* Now, if the ore-bearing solution were not even abundant enough to make a continuous deposit along the walls of the fissure, and its entrance were fitful and comparatively sudden, while the deposition of barren vein matter went steadily on and almost controlled the whole space, the result might resemble the present aspect of the Comstock, and this explanation is equally applicable to the theory of solfataric action. It tends to confirm the belief that the Comstock is a true fissure vein, not different in kind, but only in degree, from other fissure veins; that it will therefore be found to continue in depth, and that, as the fissure in depth contracts its dimensions, the appearance of the ore deposits may change, and new conditions be developed. Perhaps a continuous deposit of low grade ore may be found instead of the present segregated masses.

The 19,000 linear feet along the vein which have been for the past seven years explored and vigorously attacked, comprise all the localities from the Utah mine to the south part of the Overman, as follows:

	Feet.		Feet.
Utah	1,000	Bacon	45
Allen	1,000	Empire North	55
Sierra Nevada	3,000	Eclipse	30
Union	302	Trench Ground	20
Ophir North	1,200	Empire South	20
Mexican	100	Plato	10
Ophir South	200	Bowers	20
Central	150	Piute	19½
California	300	Consolidated	51½
Central No. 2	100	Rice Ground	13½
Kinney	50	Imperial South	65½
White and Murphy	210	Challenge	50
Sides	500	Confidence	130
Best and Belcher	224½	New York and Washoe	40
Gould and Curry	1,200	Yellow Jacket	1,200
Savage	800	Kentuck	93½
Hale and Norcross	400	Crown Point	600½
Chollar Potosi	1,434	Belcher	940
Bullion	967	Segregated Belcher	160
Exchequer	400	Overman	1,210
Alpha	278½		
Treglone	31½	Total	18,739½
Imperial North	118		

There are locations both north of the Utah and south of the Overman; but, although many of them have low grade ore near the surface, very little work has, as yet, been done upon them.† The mines enumerated have opened the vein to different depths, varying from 400 to 1,210 feet vertically below the shaft-mouths. The deepest point at present attained is about 1,410 feet below the outcrop of the vein. They have yielded about $80,000,000 since 1862, when work was systematically and vigorously commenced. Some estimates put the total value of bullion, produced since the discovery, at $100,000,000.

As it is my desire to discuss chiefly the possible future productiveness of the Comstock vein, I shall mainly confine myself, in this description, to the ground which has yielded the above enormous product, and to those bodies of ore which are still being worked.

GENERAL DESCRIPTION OF THE ORE-GROUND.

The Comstock vein (by which I mean, at present, the 19,000 feet which have been explored) may be divided into two parts—the northern part, extending from the Utah to the Chollar Potosi inclusive, and the southern, from the Imperial North to the South Overman. Between the two is the ground occupied by the Bullion, Exchequer, Alpha and Treglone, which is topographically a "divide," the surface sloping away to the north and south on either side. This is on the boundary between Virginia City and Gold Hill; and, what is still more important, it seems to be also a dividing point underground, since it is that portion of the vein which appears to have presented, at the period of the filling of the fissure, sufficient obstacles to prevent a uniform deposit, both north and south of it, of the siliceous as well as the metalliferous matter of the vein. So far as deep workings have yet penetrated, there is a difference between the northern and southern portions. The ore bodies north of this division have without exception a southerly pitch, while those immediately south of it stand almost vertically, and those still further south, without exception, pitch northward. The ores also differ, the vein matter can be in a great many instances distinguished, and even the barren portions of the vein, enclosing and often penetrating the ore bodies, are not the same in character north and south of the point I have mentioned.

DETAILED DESCRIPTION OF THE PRODUCTIVE GROUND.

I. *North portion of the vein.*—We have here four distinctly separate ore bodies.

First body.—This was found to commence near the centre of Cedar Hill, extend southward for about 200 feet, and continue 140 feet below the surface. It carried a great deal of gold, and was formerly worked by hydraulic means, but afterwards abandoned. It is irregular in form, in places 35 feet wide, and pinches out at the vertical depth of 140 feet. It lies in the ground of the Sierra Nevada company, which is now working the ore, with results varying from $3 to $12 per ton. The company has explored the ground for 500 feet vertically below the lowest point of this body, and found the vein to be filled with fragments of country rock from the east wall, clay and clayey matter, and a little quartz in very irregular seams of small dimensions, carrying mere traces of metal.

Second body.—This commenced in the Ophir North, pitched southward into the Mexican, South Ophir, Central and a portion of the California companies' ground, showing a horizontal extent of about 600 feet of available ore-ground, the whole of which yielded ore abundantly; but especially the portion in the Mexican mine, which displayed in places a breast or width of 59 feet of splendid ore. The body terminated at a vertical depth of 650 feet below the surface. It is practically exhausted, only a little ground, containing ore of very low grade, in the Central mine, being left. Explorations in the Ophir and Central for 200 feet below where the ore gave out failed to discover any other bodies. It is true a northern extension of this large ore-body is still standing in the North Ophir. It has been thoroughly explored in almost every direction, and found to extend 375 feet below the surface, and to contain thousands of tons of ore of low grade; but this ore is mixed with a good many minerals which render it, for the Washoe wet amalgamation process, very refractory, such as zinc blende, galena, arsenical pyrites, etc., and manganese ores. It is therefore at present valueless, and will so remain until it can be smelted with the argentiferous galena of Washoe valley. South of this second ore-body there is an interval of 1,384 feet, reaching to the Gould and Curry, and owned by various companies (see catalogue above) which have explored it in an ineffective way, without finding anything, to depths varying from 150 to 400 feet. It is quite possible that the large Ophir-Mexican body may have in this ground some outrunners or "feeders" (as the miners call them) or that there may be a new ore-body in depth; but, thus far, the developments made have not proved the existence of either.

Third ore-body.—This is the largest and best defined yet discovered on the Comstock vein. It commenced at the Gould and Curry claim, and extended through the Savage, Hale, and Norcross and part of the Chollar Potosi, a horizontal distance of 2,700 feet. It was found to be accompanied with many ore-seams and smaller bodies of ore, running parallel with it and sometimes dipping into it. It began to be productive 200 feet south of the north line of the Gould and Curry, and extended 1,200 feet southward along the outcrop, when it decended below the surface, and reappeared again in the Chollar. It has been worked for its whole length in the Gould and Curry, to a depth of 650 feet. In the Savage it "split" into a north and south body, and has thus far been worked in that mine to the depth of 950 feet below the outcrop. It is proved to extend in the Savage at least 1,050 feet vertically below the croppings, and at the deepest point exposed *shows a continuation still deeper.* In the Hale and Norcross, the southern extension of the south branch in the Savage was split again into an east and west body, which descending southward, terminated in that direction, the one 146 feet and the other 310 feet south of the north line of the Chollar, in the Chollar Potosi ground. In the Gould and Curry, this body has been extracted to its lowest line. It was over 60 feet wide in some places. Only some low grade ore is now left near the outcrop; and this the company will, in six months' time, completely exhaust. Explorations have been carried on both east and west of the ore-body, and for 500 feet of vertical depth beneath it, but results have not been encouraging.* The vein is filled with siliceous porphyries and clayey matter, and limestone in various forms begins to show itself through the whole 500 feet of vertical depth above mentioned.

The Savage has produced immense quantities of ore from this body. In this mine it has been exhausted to an average depth of 800 feet below the outcrop, and presented in places a breast, 96 feet wide, of very rich, solid ore. There now remains about 180 feet (vertical) of ground below the 800 feet above named, which has been explored and proved to contain the downward continuation of the ore-body. According to a very careful estimate, this ground will yield over 56,000 tons of $35 mill-ore—that is, ore which will yield by the mill process $35 per ton. As the extraction of ore from the Savage amounted to 87,342 tons during the year ending July 1, 1868, or nearly 250 tons daily, the ground thus measured will be exhausted in less than a year from November, 1868. The latest developments in the Savage, however, show that although the northern branch of the ore-body pinched out at a vertical depth of 850 feet below the outcrop, (or 650 feet below the mouth of the company's new shaft), the southern branch still continues at a depth of 1,050 feet below the outcrop. The most encouraging fact is the discovery of what is apparently an entirely new body of ore, which was met with in explorations about 100 feet below the termination of the north branch. It sets in near the centre of the mine, has thus far shown a southerly dip, and, if further developments should prove it to be extensive, will most importantly affect the future of both the Savage and the Hale and Norcross.

In the Hale and Norcross, the third ore-body now under discussion is represented by a southern extension from the Savage, split into an east and west branch. The east branch has been worked to a depth of 1,000 feet below the croppings. At this depth the ore grows narrower and poorer, and divides into separate seams, some of which are more expensive to work than productive. These seams stand more nearly vertical than the body above; and all the surroundings indicate the approach of the southern terminus of the body. The lowest workings in the mine, 1,100 feet below the outcrop, show these seams still, but only close to the Savage line; and as no new deposits of value have been yet discovered, the quantity of ore now visible in the mine is very small indeed.

In the Chollar-Potosi, as I have said, was found the continuation of the west branch of the south part of the Savage body, which had passed through the entire Hale and Norcross ground. It extended about 560 feet below the outcrop, at which depth it terminated. It has been worked out for about 290 feet horizontally in the Chollar, to its terminus in depth. A small branch of ore, coming from the east branch of the southern part of the Hale and Norcross body, was found in Chollar about 200 feet east of the continuation just described, as worked out on the west. It seemed as if it had been torn away from the main body; commenced to show itself 342 feet below the surface; was worked for a length of 100 feet; descended along the east wall vertically for 150 feet; and terminated on all sides in small, valueless seams of quartz. It is now entirely exhausted. The company has carried on explorations for 700 feet below the lowest portion of this branch, giving a total depth explored of 1,310

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* I write this chapter purposely without reference to the masterly essay of Richthofen on the Comstock vein—not because I do not acknowledge its ability, and, in the main, agree with its conclusions; but because an adoption and free use of them would add little to the authority of that work, and detract from the independent value of this.

† Developed, I mean, by mining work.

‡ It is a curious fact that miners always "put the cart before the horse," in describing the phenomena of their profession. For instance, if a vein, in some rich zone or pocket, is accompanied by side crevices or "stringers," which also carry valuable ore, it is said that the "stringers have enriched the vein;" if a "horse," or mass of country rock lies in the middle of the vein, and the ore continues around both sides reuniting beyond, the vein is said to have split and come together again; if a vein is broked along the line of a cross fissure, and by the slipping of the country rock, one half the vein is moved along, so that it is no longer opposite the other half, and the cross-fissure, afterwards filled with mineral, becomes itself a vein, it is said that the new vein has "heaved" the old one. Veins are talked of as bulging, contracting, changing their strike and dip, as though the intrusion or deposition of their mineral contents were itself an acting cause in determining their form; whereas the form of a vein is generally determined by the previous fissure, and the changes which may take place after the opening of the fissure, but before it is filled with mineral. This way of speaking, however, is convenient, and does no harm, if we bear in mind that it is merely fictionary. I cannot agree with Professor Silliman, who, (if correctly reported), holding to the theory that many veins are filled by solfataric and thermal-aqueous agencies, nevertheless says that the fissure is frequently widened by the forces of crystallization. The manner in which thermal waters deposit their precipitates, and the phenomena observed in veins themselves (vugs, empty spaces, and many other things), as well as the analogies of hot springs, where veins are actually being filled, contradict this hypothesis emphatically.

* A double vein is the result of the reopening of a fissure-vein after it is once filled, and the intrusion of new vein-matter by the side or in the middle of the old.

† The Sierra Nevada mill has been, during the summer, successfully reducing the low grade surface ores of the northern end of the Comstock. They contain some gold.

* Since this report was written there has been a little stir about the discovery of a body of ore in depth, by the Bonner shaft. This is a mere quartz body, such as frequently occurs along the wall; and is no proof of the neighborhood of a profitable ore-deposit,

feet below the outcrop. These explorations showed the vein to be filled principally with clayey matter, carrying very little quartz and no ore at all. The absence of quartz at the depth attained is not encouraging.

Fourth ore-body.—This was situated west of the southern portion of the third body, above described. It made its appearance close to the north line of the Chollar, (in what was formerly the Potosi and Bajazette ground,) at the surface; extended along and near the surface for 900 feet; and found its terminus at the depth of about 500 feet. It varied materially in character from No. 3. Its ores were more highly oxidized and more irregularly distributed. In places it was 125 feet wide; it was often split into three or four parallel courses; and it has yielded immense quantities of ore. In 1867 it yielded for months together from 500 to 550 tons of ore daily. (The company's report for the year ending June 1, 1868, puts the whole amount of ore extracted in twelve months at 70,330 tons; but this was not equally distributed through the year, as the yield from the "Third Santa Fe" station, in the body of ore now under discussion, ceased in February, 1868.) The Chollar-Potosi has been noted, even among the Comstock mines, for the extraordinary rapidity with which its ores have been extracted; but it may fairly be questioned whether the policy pursued has been wise. This ore-body ought to have given the company three years at least of very profitable mining; but the largest and by far the best part of it is already extracted, and a large portion has undoubtedly been wasted by a too speedy extraction. There is enough ore of low grade left to occupy the company nine months more; but the average value has been so reduced by the extraction of the best portions, that the remainder will pay but little more than the cost of mining and milling.

This concludes the description of the northern portion of productive ground on the Comstock vein. The ore-bodies described are distributed through more than 13,000 of the 19,000 linear feet under development.

South of all this occurs an interval of about 2,100 feet of unproductive ground, including part of the Chollar, the whole of the Bullion, and part of the Exchequer claim. The Bullion company has expended, it is said, more than a million dollars, and explored the ground to the depth of 1,210 feet below the surface without finding any ore-bodies.

II. *South portion of the vein.*—Here we meet with seven ore-bodies, much more irregular than those of the north portion, already described.

First ore-body.—This appertains to the outcrop, and commenced at the Alpha mine, extending about 2,300 linear feet into the Crown Point. It lies west of all the bodies to be described hereafter. In no case was it found to extend deeper than 275 feet. It was in places more than 200 feet wide; so that in the exploitation of it the whole side of the mountain, from the Imperial to the Confidence, has been excavated. Its yield of ore has been immense, especially for the last eighteen months, previous to which period its ores were thought to be of too low a grade for profitable extraction. By far the largest portion of the bullion produced in 1867 came from this body: but it may be considered as practically exhausted, only here and there a patch of ore, of very low grade, now remaining.

Second ore-body.—This commenced in the south portion of the Exchequer; passed through the Alpha, Treglone, Imperial, Bacon, Empire, Eclipse, Trench, Empire South, Plato, Bowers, Piute, Consolidated, Rice, and part of the Imperial South, showing a horizontal length of about 810 feet. This body divided into many smaller ones; but the axis of its main bulk stood almost vertical in the vein. In the Imperial North it reached its deepest point, 750 feet below the outcrop, and here it lay pretty close to the west wall, while south of this mine it nowhere extended to so great a depth. Between the Imperial North and the Empire North it attained its maximum width (in places 115 feet) and split into various smaller bodies, some of which, especially those near the surface, still continue to yield ore in the Alpha, Imperial, and some of the smaller claims; but the quantity now remaining is limited, and will not yield great profit. The Imperial and Empire companies, conjointly, have sunk a very large new shaft to explore the vein below the point where the ore terminated. This shaft, with its drifts, has partially explored the ground for 200 feet deeper (in all 900 feet below the surface;) but the work has thus far not given encouraging results in the form of ore, though the quartzose gangue has been discovered at the depth named.

Third ore-body.—This body commenced south of the Imperial South, and extended, with a slightly eastward dip, into the Challenge, Confidence, New York, and Washoe, and the north part of the Yellow Jacket, having thus a horizontal length of about 600 feet; it proved to be very irregular in form and dimensions. Its deepest point was 600 feet below the outcrop in the Confidence; from there it rose to the southward, and in the North Yellow Jacket it proved to extend only 475 feet below the outcrop, where it abutted abruptly against the east wall, which it followed downward for some distance, growing narrow and poor, and finally pinching out. Its heaviest portion lay in the south portion of the North Yellow Jacket, 370 feet below the outcrop. It is now exhausted. Some ore is left near the surface all along the course of the body, but it is of too low a grade to be extracted at present with profit. The Yellow Jacket is the only mine on this body in which explorations have been continued below the terminus of the ore. That company has sunk 350 feet deeper, found some small detached bodies to the east, worked them out, and came finally into entirely barren ground, filling the whole fissure. At the deepest point attained in this mine the vein shows the phenomenon of a dislocation of the vein matter from west to east, which will be discussed further on.

Fourth ore-body.—This commenced in the south portion of the Yellow Jacket, 430 feet south from the one last described. It went through the Kentuck, Crown Point, and part of the Belcher ground, showing a horizontal length of 1,160 feet. It was much more regular than the foregoing, had a general western dip, and proved to be widest in the Yellow Jacket, near the Kentuck line, in places 90 feet. In the Belcher it extended 300 feet vertically, in the Crown Point 400 feet, in the Kentuck 450 feet, and in the Yellow Jacket about 500 feet below the surface, and in all of them it was cut off very abruptly in or near the centre of the vein. It may be said to be entirely exhausted of its ores. (See description of No. 6, below.) The Belcher company explored for 600 feet vertically below the south portion of this body, but so far without successful results; the vein is entirely barren at the depth attained. The explorations of the Crown Point and Yellow Jacket fully demonstrate the "fault" in the vein matter, to be described below.

Fifth ore-body.—In the Segregated Belcher, (south of the Belcher mine,) and about 900 feet south of the southern terminus of ore-body No. 4, commences a piece of ground which extends about 1,100 feet southward, and has contained a series of very irregularly distributed ore-bodies, which have, in places, been very productive. They all had a general incline to the north, and dipped east with the vein. This 1,100 feet of ground has proved remunerative to an average depth of 450 feet below the surface. The outcrop is "blind" or hidden. North of the Segregated Belcher and south of the Overman this ground terminates. The principal portion of it is already worked out; a good deal of low-grade ore still stands along its course, but the only good ore known to remain is in the Overman, where there is enough to occupy the company, at the present rate of extraction, for probably six or eight months. Some small seams and stringers of this great mass extend below the depth at present attained by the Overman; it is quite likely that some of these may widen out at still greater depth; but, as yet, they only contain low-grade ore, and do not exceed six feet in width.

Sixth ore-body.—The large body described as No. 4 of the Yellow Jacket, Kentuck, Crown Point, and Belcher, extended to the depth of 400 to 500 feet vertically below the surface, where a body of clayey matter, originating from a heavy dike of felspathic porphyry, cut it off very abruptly. In the Yellow Jacket, explorations were carried on for 100 feet vertically below this line, but without success in finding ore. In the Crown Point, explorations were made both eastward and downward; and the vein matter to east of where the ore gave out found to be replaced, frequently for a horizontal distance (east and west) of 150 feet, with various species of porphyry, of which felspathic porphyry predominated. As the prospecting work advanced eastward, the vein began to carry quartz again, and, about 450 feet east of the place where the ore was abruptly cut off, this quartz began to carry ore. Fifty feet further east, in the 500-foot level of the Crown Point, a very fine body of ore was discovered. West drifts from the first body to the west wall proved the ground to be barren. *This conclusively demonstrated that the vein matter had suffered a dislocation from west to east*, and the ore found east was locally termed the "East Vein." This body has thus far been explored and worked for a horizontal distance of 400 feet. It has its southern terminus about 200 feet south of the north line of the Crown Point; its northern limit has not yet been determined. Its upper edge is 75 feet above the 500-foot level of the Crown Point; it dips with the east wall slightly to the east, and inclines so decidedly to the north in depth, that the 900-foot level of the Crown Point has not a trace of it, even at the Kentuck line. (The ore has therefore made 200 feet "northing" in 400 feet vertical depth.) The terminus of this body in depth has not yet been found. The Yellow Jacket explorations (850 feet vertically below the surface) show it still continuing downward and northward. In the Crown Point it is nearly exhausted. A careful estimate of what is still standing shows about 4,000 tons of ore that will produce $30 per ton by the Washoe wet-crushing and amalgamation. The Kentuck has also extracted a great deal from this body. At the time of my examination of this mine, some 450 tons of ore daily were hoisted from ground not exceeding 93 linear feet upon the vein. The amount of ore standing in the Kentuck is estimated at about 25,000 tons of $35 mill-ore. The Yellow Jacket has extracted large quantities, and still retains in view about 19,000 tons of $36 50 mill-ore. As the lower line of the ore-body has been found in Crown Point, the above estimate for that mine is very nearly correct; but, in Yellow Jacket and Kentuck, the ore extends in depth below the ground included in these estimates; and they are therefore too low.

This completes the description of all the productive ground of the Comstock vein, thus far developed;* summing it up, we have a total of nearly 19,000 feet explored on the vein, and an aggregate length of 5,396 feet of productive ground, viz.:

	Whole vein.	Productive ground.
1. In the north portion	12,164 feet.	3,246 feet.
2. In the south portion	6,553 feet.	2,150 feet.

PROSPECTS OF THE MINES.

The foregoing description shows that very little of the productive portion of the vein is now standing. Nearly all the mines contain low grade ore, some of them even in large quantities; but these ore reserves lie, for the most part, at or near the surface. The Hale and Norcross croppings, for instance, have scarcely been touched. They cannot profitably be worked at the present current expense of beneficiation.

Considering that the average width of the Comstock is 175 feet, and the greatest depth attained is only 1,210 feet below the surface (Bullion shaft), while the work of testing the ground in horizontal directions has not kept pace adequately with the depths attained, we may say that explorations have not been very thorough; but the fact remains that, although there is much undeveloped ground on the Comstock vein, the work thus far does not present very encouraging results for the *immediate* future. On the north portion of the vein there are only two mines, (the Savage and the Hale and Norcross), which show at present a vertical continuation of ore-ground. Many others, as I have said, have considerable reserves of low grade: but in every case the limits are known, and are near the surface. On the south portion of the vein the prospects are a little better; yet even here there are only three mines (Kentuck, Yellow Jacket, and Overman) which insure us at present a vertical continuation of ore. The low grade reserves of other mines are considerable; but their limits are known. It is now established that all the ore in this vein exists in zones or bodies which terminate somewhere; and it is impossible to say at what point the descending bodies in the five mines enumerated may find their lower limits. The only hope for the future is the discovery of new bodies of ore (one such as has been discovered in the Savage; see description above, under ore-body No. 3 of the north portion of the vein.

Judging from present appearances only, and regardless of probable or possible new developments, I should say that remunerative operations on the Comstock proper* can only continue for eighteen months or two years longer. Of course it is possible that new and brilliant discoveries may at any time completely change the face of affairs. All speculation of this kind is, however, only speculation; and so far as we have any indications afforded, they are, I think, unfavorable to the hope of immediate discoveries of ore. In this connection the following considerations may be of value:

Since the beginning of operations on the Comstock, the ores have diminished in quality and quantity as the work advanced in depth. No later than last year, the waste-piles of 1864 were overhauled, and immense quantities of $40 mill-ore† were obtained. In 1864 this ore was discarded as too poor; now many a mill-owner would be glad to buy a large dump of $15 ore. With one exception (where the vein-matter has been dislocated from west to east, in Belcher, Crown Point, Kentuck, Yellow Jacket), the productive ground has been the downward continuation of the outcrop. The bottom of the outcrop-zone has everywhere been reached, and an unproductive period of vein has been entered, the extent of which is unknown. The explorations in depth are not yet sufficient to lead to any decisive conclusions; but some things there are which seem to indicate that this barren ground will continue further than many suppose. For instance, it has been observed throughout the Comstock that, wherever quartz forms the larger portion of the vein-matter, there the heavier deposits of ore have been found. Now it is found that the depth, especially in the northern portion of the vein, limestone in various forms gradually replace the quartz; and no traces of metal have yet been found where the limestone predominate. Should limestone eventually form one of the principal constituents of the vein-matrix, it is quite evident that the character of the ores will be changed from that which they bear when accompanied with the quartz; and this change or transition in both ore and gangue would be likely to occupy a considerable period of the vein, through which the mines would have to pass, without meeting with much ore ground of value. On the other hand, should further developments prove the limestone to exist only subordinately and not to interchange with the quartz, then the present barren zone might be regarded as the alternative of the productive ground above; and, *from present appearances*, it is likely to continue in propertion to the amount of the latter.

In the southern portion of the Comstock, the same phenomena have not been met with; and prospects are not quite so discouraging. Here we have a decided dislocation of the vein-matter from west to east, by a dike of porphyry in the vein. The west wall, where it has been reached, through this immense dike, which lies immediately upon it, seems not to have been disturbed. The dike consists principally of porphyry of various characters, imbedded in which are smaller bunches of trachyte. It has been explored for 1,300 feet in length, and in places cut across, showing a width of 400 feet and less. Further explorations must prove whether this dike originated before or after the filling of the Comstock fissure, or contemporaneously with that process. It is possible that the first of these will prove to have been the truth—there are so few decisive signs of motion in the vein in this vicinity—and in that case the vein-matter will gradually recede from east to west again; and we may from analogy expect ores in successive bodies until the west wall is reached. But should this dike be of more recent date than the filling of the fissure, or, still worse, of contemporaneous origin; and should its course prove to have been upward between the walls, (which is possible, since it is not known to have broken either wall) it may have filled the entire vein for a considerable distance; and the chance of immediate discoveries of ore would naturally be very small.

The irregularities and alternations of the Comstock may naturally be expected to occur on a scale proportionate to the magnitude of the vein, and the present barren zone, however extensive, is no indication that the ore-bodies will not recur in depth. The great practical question relates to the manner in which prospecting work shall be continued. The present method of isolated shafts and exploring drifts is very expensive; and it is to feared that, when the ores now in sight shall have been extracted, the perseverance and capital of the companies will not be equal to the task. Besides, the ore may be expected to be more refractory in deeper zones; the larger proportion of native gold and silver which forms the chief yield of the simple "Washoe process" of direct amalgamation, and without which that process could not be employed, may give place to the sulphurets, which are now subordinate. The cost of drainage and hoisting will increase with every hundred feet of added depth, and, in many mines, new and more powerful machinery will be required. Ventilation must be improved—a matter which has yet received but little attention. The newspapers lately called attention to the extremely oppressive temperature in some of the deeper workings, and, ascribing it to the internal heat of the earth, expressed apprehension that it might prove a bar to future operations; but the internal heat of the earth will not trouble the mines for many a day, if provision is made for the removal of foul air and the heat of lamps and human bodies. All this entails grave expense, which few of the companies can bear, unless very rich deposits are soon discovered. If, on the other hand, the barren ground to be traversed by vertical workings should be as extensive as those barren intervals which have already occurred on the horizontal course of the vein, (some of them 1,300 feet or more in length,) the outlay required for explorations would be enormous. It is important to bear in mind that, while the discovery of new ore-bodies would postpone the evil day, it would not relieve the mines from the constant expense and burden of the present system of working. The true economy is to open the vein by a deep tunnel and drifts, reduce the number of shafts, and consolidate the management of the mines in many respects. (Ownerships of course may remain as they are, but administration should be modified by association.)

* Concerning a more recent discovery in the Yellow Jacket, the Enterprise of December 30, says:—"This strike is one of the most important ever made in the mine or upon the great Comstock lode. We say so for the reason that it is the first large deposit of extraordinary rich ore ever found at so great a depth upon the lead. Two big deposits have been found—one in the 900, and one in the 800-level, but the former is by far the richest and in every respect the most important. The vein in the lower level is fully nine feet in width, and is composed of what is called 'sacking ore'—ore so rich that it is not rudely shoveled and tumbled about, as is the case with that of a lower grade, but is put up in sacks and tenderly cared for. It is ore that will yield some thousands of dollars per ton (we don't exactly know how many, as we have seen no assays), and is just the next thing to finding the silver already moulded into bricks. The ore is composed of both chlorides and sulphurets, and is of a soft and crumbling nature; at least such was the character of all the specimens shown us yesterday. In the 800-foot level, about 90 feet north of the south shaft, has been found a large deposit of very rich ore, though it contains more iron and is not so much like the pure bricks as those below. Let us hope that the barren belt of the Comstock has at length been passed, and that at least one mine has entered upon the rich deposits of a second and more valuable belt than that found near the surface. This strike is certainly most encouraging to all mining companies holding ground on the Comstock, and we hope soon to hear of others striking down into the new White Pine of our own big lode." I confess that I do not share the sanguine expectations above set forth. The "strike" in the Yellow Jacket is, I am informed, very important; but later and more detailed accounts must be awaited before any opinion can be formed. In the mean time I see no reason for modifying the views expressed in this chapter.

* For a description of the metalliferous veins of the neighborhood, outside of the Comstock, see below.

† That is, ore that yields $40 per ton in the mills, not by fire assay merely.

Texas.

REPORTED DISCOVERY OF GOLD AND SILVER IN THE RIO GRANDE VALLEY.

A correspondent of the New Orleans *Picayune* from El Paso, February 19, says:—"For some time, B. F. Williams, a lawyer of El Paso, who formerly resided at New Orleans, has been making a careful survey of the geological formations of this vicinity, and finally became satisfied of the existence of gold in the valley of the Rio Grande. Upon the 16th inst., we collected a party of old California miners and sunk a shaft to the depth of about 7 feet to the bed rock. At three feet in depth black sand and 'color' was obtained, and at 7 feet gulch gold was found. Four pans of dirt yielded 54 cents. Labor was then suspended until the 17th inst., when the party returned to the shaft, accompanied by Mr. Joseph Shultz, of the firm of Shultz & Bro., of El Paso. Mr. S. is a gentleman of high character, and a member of the largest commercial firm on the Rio Grande, in the vicinity of El Paso. Mr. Shultz washed himself three pans of dirt and obtained 85 cents. This experiment justified the conclusion that we are upon the eve of great discoveries. The gold is found in 'placers,' and is of remarkable fine quality—worth at least $21 per ounce. There are also rich silver mines somewhere in this

locality, but they at present are known to but few Pueblo Indians. Tradition places the locality of the richest mine known to the Spaniards in the neighborhood of El Paso. In the year 1860 the Indians rose simultaneously and either murdered or drove from this country the Spaniards, and the site of many valuable mines was afterwards lost."

Michigan.

The Marquette *Mining Journal*, March 6, reports that gold has been discovered in very considerable quantities on the lands lately owned by Waterman Palmer, Esq., an analysis of which at the Philadelphia mint, shows a yield of from $600 to $900 to the ton of rock. It adds: "The existence of gold in Marquette County has long been known and acknowledged, but it was not believed to be of sufficient importance to warrant any considerable expense in the way of exploration. This latest discovery seems to warrant the belief that iron is not our only source of wealth, and it is not impossible that Lake Superior may ere long be set down as one of the gold-producing districts of the United States."

COPPER.

Michigan.

The Ontonagon *Miner*, March 13, reports that the management of the Caledonia Mine "authorizes the employment of 20 additional miners. At opening of navigation the force will probably be doubled....The Lone Rock Mining Company, we understand, intend to commence operations within a few months. Other mines in the Porcupine Mountain District will also undoubtedly resume work. We have not learned what the intentions are as to the mines west of the river, but presume that the Victoria, Tremont, Devon, Norwich, etc., will employ forces. ....The Tributors at the Norwich Mine have lately struck a mass of copper, one end only of which is in view, the other end goes, it is impossible to say, where. The indications are good for a 'big thing.'....We understand negotiations are pending for the purchase of the National property by Boston operators. The indications are good for a trade. This would transfer the main office of the company from Pittsburgh to Boston. A good many would like to see a change in Minnesota and a half dozen other new ownerships."....From files of the Portage Lake *Gazette*, to the 11th inst., we condense the following items of news:—"An assessment of $1 50 per share has been levied on the Hancock....The following February products have come to hand:

SCHOOLCRAFT MINE.	
Stamp work	25 tons, 100 lbs
QUINCY MINE.	
Stamp work	81 tons, 565 lbs
HURON MINE.	
Mass, barrel and stamp	70 tons, — lbs
FRANKLIN MINE.	
Stamp, barrel and mass	85 tons, — lbs
PEWABIC MINE.	
Mass, barrel and stamp	57 tons, 100 lbs
SOUTH PEWABIC MINE.	
Mass, barrel and stamp	107 tons, 500 lbs

"The Hecla product for month of February was 250 tons. An additional hoisting engine has been set to work at No. 1 shaft, where some of the richest rock ever taken from the mine is being hoisted. The Calumet product for the month of February was 155 tons. The winze north of No. 2 shaft is down to the fourth level, and drifting commenced. The lode at this point is said to be remarkably rich, fully equal to the large pit first opened. Among the laborers there was a disposition to strike for higher wages. A few of the ring-leaders were discharged, and all are sensibly and quietly at work again, fully satisfied that wages will will advance sooner if no strike is attempted.....From the appearance of the fine looking masses brought down from the Cliff daily, there can be no doubt that the bottom of the mine still holds good. The breakage of a stamp axle has delayed the stamps somewhat, but they expect to be running full time again soon....The show of mass copper at the Phoenix in the Bay State vein continues to hold good, heavier copper showing as the stopes progress. The back of the present level, judging from the one above, is good for 1,000 tons, at least! The little stamps are working splendidly; in fact, doing all that has been claimed for them. The amount of copper from this mine now on the dock is greater than has been for many years.....The yield of the Allouez conglomerate last stamped at the St. Clair mill is a little over 2 1-2 per cent., but the miners state that this will be exceeded when the openings are made....The exhaust steam from the Caton mine shows that life still exists, and they are supposed to be working a force of sixteen men. They have a fair amount of stamp rock on hand, and when the stamps are started in the spring we may hear of a fair shipment. Underground prospects are reported to be as encouraging as ever.... Spencer Shaft at the Copper Falls is being pushed as rapidly as possible toward the 90, and in the course of another week it is hoped connections will be made. Stoping will be commenced in the vicinity of the shaft, and no doubt with good results, judging from the amount of mass copper exposed in the lode.....The January product of the National Mine was:

Mass	7 tons, 1,134 lbs
Barrel	2 tons, 296 lbs
Total	9 tons, 1,430 lbs

LEAD.

Illinois.

The Galena *Gazette*, March 16, says:—"150,000 pounds of mineral was raised last month from the mines of Crawford, Mills & Co., of Hazel Green. This is an average of more than 6,000 pounds per day, for working days. The price of mineral during the month averaged about $58 per thousand. The month's income from these mines was $8,700. But a pleasant thing to contemplate in connection with this yield is that the mines are constantly improving by the opening up of new ground, and the prospect is for a much heavier income in future. There are about 800 acres belonging to this firm, all of which is known to be rich mining ground, and is drained by a level. It is an immense fortune to the owners."

TIN.

Oregon.

DISCOVERY OF TIN IN DOUGLAS COUNTY.

The Roseburg *Ensign*, January 30, has the following account: "Some time since a letter written by one Foley, from Cow Creek, in this county, was published in the McMinnville *Courier*, in which said Foley claimed that genuine tin ore had been discovered in the vicinity of Cow Creek; but as such discoveries are frequently reported by sanguine prospectors, who afterward find out that they have been deceived, very little credence was given to the report. It now appears that Foley had a reasonable foundation for the conclusion to which we arrived from an examination of the ore. Mr. William Briggs, of the Cow Creek Mining District, this week gave us a sample of the ore taken from the vein mentioned by Foley, and it certainly answers the description of tin ore in every particular, and it is said that the test to which it has been put convinced those who examined it that it is tin. Mr. Briggs also permitted us to read a letter from Thomas T. Bouldin, of San Francisco—who has had a sample of the ore carefully assayed—in which Mr. Bouldin asks for information in relation to the lead, and states that it exhibits enough to warrant the expenditure of money. He further assures Mr. Briggs that, if such ore can be found in sufficient quantity, he is willing to undertake the development of the lead."

IRON.

Wales.

THE WELSH IRON MINES—THE MINERS, THEIR FAMILIES, AND THEIR WORK.

The English magazine, *Good Words*, has begun the publication of a series of papers entitled "Toiling and Moiling: Some Account of our Working People, and How they Live," the first chapter devoted to the iron workers at Merthyr, in Wales. The writer's style is crisp, his facts are well grounded, and the historical illustrations are good. We quote a few passages:

GENERAL ASPECT.

"There is something funny in hearing pits spoken of as if they were as plentiful as hips and haws. My path leads past a great embankment of cinders, still smouldering, as the lazily curling white smoke-wreaths show; past great blocks of slag that look like the shell and pebble-plumed boulders of clay found on our eastern sea coast; across a tramway, whose ballasting, save where it is frozen in the shade, seem made of very sticky blacking; up a steep bank of damp coal dust; over a little wall; and along another line of rails, as filthy as the former, which curves out of a low, goblinish tunnel-opening in the hill-side, and whose metals are being freed from the viscous mud that clings to them by a bent old man, and a girl in semi-masculine costume, and with a most unfeminine face. On one side, the lambent tongues of the Plymouth furnaces—pale pink in the bright daylight—are flickering above gushing and billowing steam; on the other, are one or two yellow residences that rank, I suppose, as cottages *ornees* in Merthyr—the ornament of one being a great slab of coal set upon its lawn; low heaps of iron ore stacked like stone to be broken for road-mending, and each block marked with its miner's number, letter, or distinctive cross; seven or eight young women in coarse, sleeved pinafores, handkerchiefs tightly bound over their heads, battered hats, bristling with frayed feathers, blue stockings, and, in some instances, masculine overalls—some helping to unload the trucks that come up the shaft, and others pottering with shovels about the 'tip;' a little hovel at the pit-mouth; a wooden frame above it, gibbetting two great wheels, with broad, flat, glossy bands, that look like magnified figs of negro-head tobacco; and at the foot of the tip, where more girls and a boy or two are shoveling coal, an engine house to which access is obtained by a narrow plank uncomfortably near to a hot pipe. This is an iron mine proper—a 'mine pit,' as it is called in the neighborhood, 'mine' being the Glamorganshire miner's equivalent for 'ore.'

WAGES.

* * * "My guide is a short, civil fellow, with a bronzed, ruddy face like a sailor's. Fifteen shillings a week, he says, he gets; the overman getting 30s.; and the engine man 2s. 6d. a day. The miners, working by the ton, must be 'good men,' he added, to average 20s. a week.

"You ask a roller what he gets for his twelve hours' 'shift.' '25s. a week, but the rail-rollers down below can make 40s., and I've to pay my boy 4d. a day.' And the puddlers? 'Oh, about the same as us now, but they might make 28s. We're all paid by the ton.' Does he belong to a union? 'No, we was to have a union once, but the young man run away with the money. Yes, indeed, but the new Parliament, I dare say, will make that all right. You'll let me drink your health, sir?'

PRODUCTION.

"About 1,000 tons of coal a day are consumed at Dowlais, and its score of blast furnaces turn out each some 80 or 100 tons of pig iron per week. Cyfarthfa, the property of those iron Crœsuses, the Crawshays, employs 5,000 hands, and Plymouth, once the property of the same family, 4,000. All round about Myrthyr, also, to say nothing of Monmouthshire, the furnaces are flaring. Within the memory of not very old inhabitants, Aberdare has sprung up from a still smaller village than Merthyr into a far more civilized-looking town. Its elegant modern churches, its commodious modern houses, contrast far more strikingly than anything of the same kind in Merthyr with its village nucleus—the whitewashed old church with one bell in its gable, and coffin-shaped parterres of homely flowers, the thatched or stone-roofed white and yellow cottages, over whose stepped-stone stiles young Evan Evans chases Griffiith Griffiths. Walk up the mountain side from Aberdare to the Abernant station on a faintly moonlight night, and you can see a blending of the natural and the artificial picturesque that will pay you for your trouble. Beneath the crescent moon the hills lie dimly interfolded all round. Impish collier boys, loudly larking, and silent grown-up colliers, taking surly stock of the stranger, pass you on their road home from pits that send up their one thousand tons per diem. On both hands there are works, with their dimly grand jumble of snowy vapor, belching flame, black buildings blotched with gas light, pitchy tips illuminated with flickering variegated fires, and beams, and wheels, and chimney stalks rising with phantom-like lack of anything to stand upon, out of the cross-lighted, surging chaos. As the train runs on to Merthyr, too, you see more works in the valley of the Cynon, burning like Cities of the Plain, and flushing the sky with a pulsing, rosy, brassy glow.

* * * "I went to a well-filled miner's chapel, and there I heard hearty and harmonious singing; but the sermon at first did not sound half so spirited as the rector's to his depressingly small congregation. The preacher prosed on without a tone of music in his voice, and his hearers listened in languid silence. The liveliest member of the congregation was a fair-haired little Welshwoman, in a pinafore and without a bonnet, who was playing all kinds of pranks upon her mother's knee. In some of the Welsh chapels, I am told, children are allowed to run about during service. But presently a sound like a pavier's grunt was heard from one of the pews, and the preacher grew more energetic. It was repated, it was echoed; it culminated in a chorus of heartily approving *ha's!* The preacher then put off all his prose, and throughout the rest of his discourse chanted like the clergyman; a running fire or *ahmeens* punctuating every sentence.

"The High street was thronged with the congregations that poured out from the different places of worship in the evening, and some of the worshippers instantly adjourned to the public house. I overheard this conversation in a bar: 'Was you at chapel?' 'No, but I was at Sunday school.' 'Was you ever at church, John Jones? 'Yes, indeed; but they never give me no book.' 'They knew you couldn't read.' 'I can read; yes, sure; but I never go to church again till I was married.'

CONCLUSIONS.

* * * "The noisiest night in Merthyr is what is called *Dydd Llun dechra'r mis*, or 'Monday the beginning of the month.' Up to about mid-day on the previous Saturday the men have been working like horses that they may have as much as possible to take on the following Saturday, which is pay day—a week being needed to calculate the month's work. Having done so, they hold revel, especially on this Monday, and some of them scarcely go back to work during the rest of the week. At all the works there is a 'draw' every week, and on the Saturday after pay day, which is called 'big draw,' almost as much money is drawn as on pay day. Most of the works pay once a month, but at Dowlais, owing to the unavoidable complication of accounts in such a huge concern, there are generally three months' pay.

"Perhaps the most painful features in the South Welsh mineral districts are the hardness of the work which the girls and women have to perform, and its unsexing nature. It is strange to see them so merry over it. But if they threw it up, they could only take their choice between farm labor and domestic service, neither of which are remunerative in Wales. A servant, in every way as handy and as useful as many who are getting £10 or £12 a year in London, can be hired for 5s. the lunar month in Merthyr."

Correspondence.

[To insure insertion of correspondence in our columns, the full name and address of the writer must be given.]

Missouri Tin.

U. S. Geological and Mining Cabinet,
Washington, D. C., March 24, 1869.

Editor Journal of Mining:

Sir:—The "tin fever" in Missouri is on the increase, and I am daily receiving packages of syenitic rock with bars of metallic tin, claimed to have been smelted from them. These rocks have a resemblance to syenite, but in order to ascertain the true nature of them, both of the feldspathic portion and of the black mineral mixed with the same, I submitted an average specimen from Madison County to Dr. F. A. Genth for full analysis. He finds it to contain:

Silicic acid	45.95 per cent.
Titanic acid	1.87 " "
Stannic acid	0.50 " "
Oxide of iron	15.26 " "
Oxide of manganese	0.18 " "
Alumina	14.32 " "
Magnesia	4.44 " "
Lime	10.36 " "
Alkalies	7.12 " "
	100.00

From these results it appears that the rock contains about 4.5 per cent. of brown titanite or sphene. This is the mineral which probably has been mistaken for the tin. If we presume that a portion of the titanic acid in the sphene is replaced by stannic acid, which may be the case on account of the isomorphism of the two substances, the percentage of sphene would be increased to about 5.7 per cent. How the other substances are arranged can only be ascertained by fuller investigations. A portion of the iron oxide is present as magnetite. The presence of magnesia renders it probable that this, together with lime and oxide of iron, are present as pyroxene. The feldspathic portion is probably labradorite or anorthite or a similar mineral.

A. R. Roessler,
Geologist, General L. O.

Diamonds in Georgia.

Geological and Mining Cabinet, General Land Office, Washington, D. C., March 23, 1869.

Editor Journal of Mining:

Sir:—This office is in receipt of reliable information concerning diamond discoveries in Georgia. In washing for gold in a pit of 4 by 6 feet, three diamonds were found of one and two karats weight, by persons who did not know them, and who were only attracted by their brilliancy. The property is rich in placer gold, and the diamonds are of the first water.

A. R. Roessler, Geologist, Gen. L. O.

[We cannot understand from the above brief letter of Mr Roessler whether the stones have been preserved or not. At all events, the occurrence of the diamonds in Georgia is fully established by former cases.—Ed.]

—Zinc may be given a fine black color, according to Knafll, by cleaning its surface with sand and sulphuric acid, and immersing it for an instant in a solution composed of four parts of sulphate of nickel and ammonia in forty of water, acidulated with one part of sulphuric acid, and washing and drying it. The black coating adheres firmly, and takes a bronze color under the brusher. Brass may be stained black with a liquid containing two parts of arsenious acid, four hydrochloric acid, and one of sulphuric acid, in eight parts of water.

—A new manner of constructing the fire-places of locomotive boilers has been devised, having for its object to produce a boiler in which the lower flues cannot be clogged by cinders and ashes, and in which a fire-place of just sufficient size is arranged. The invention consists chiefly in the application of a discharge channel, through which the ashes, cinders, and other impurities can, from the inclosed plate in rear of the flue sheat, fall to the ground, so that thereby the lower flues are kept clear.

MARKET REVIEW.

Friday Evening, April 2, 1869.

Gold and Silver Stocks.—The market in Gold and Silver Stocks shows some activity, with quotations as follows:

	Bid.	Asked.		Bid.	Asked.
Alameda Silver	..		Kipp & Buell Gold	..	
American Flag	..	..	La Crosse Gold	15	17
Bates & Baxter Gold	..	..	Liberty Gold	..	
Benton Gold	15	25	Manhattan Silver	00	
Bobtail Gold	..	..	Midas Silver		
Black Hawk Gold	15	1 00	Montana Gold	33	34
Consolidated Gregory	2 70	2 80	New York	70	
Edgehill Mining			Nye Gold	..	
Gold Hill	..	..	Owyhee Mining		20 00
Gunnell Gold	..	..	People's G. & S. of Cal	..	
Grass Valley	1 25	1 30	Quartz Hill	92	95
Hamilton G. & S. B.	..	..	Rocky Mountain Gold		..
Holman	..		Smith & Parmlee Gold	1 85	1 90
Hope Gold	..	..	Texas Gold	..	
Twin River Silver			Corydon	..	..
Gunnell Union	..	..	Symonds Fork Gold		
Combination Silver	..	..	N. Y. & Eldorado		
Sensenderfer	..	..	Mariposa	..	
Quicksilver	21	..	Mariposa preferred	..	
Atlantic and Pacific	..		Eagle Gold	..	

Copper Stocks.—Copper Stocks are quoted as follows:

Central	35 00	Davidson	25 50
Flint Steel River	5 00	Hilton	2 00
Minnesota	3 00	Rockland	3 00

The following are the prices of mining stocks bid in Boston this day:

Copper Falls	9¼	Quincy	24½
Franklin	17⅛	Cary Improvement	8
Hancock	4½	Hecla	..
Minnesota	2	Bos. Hart. & Erie R. R.	23½
Calumet		Isle Royal	..
Water Power	15½		

Petroleum Stocks—But few transactions are reported in Petroleum stocks, which are thus quoted at the Poard.

	Bid.	Asked.		Bid.	Asked.
Bennehoff Run	..	60	Rynd Farm	10	
Brevoort	1 25	2 00	United Pet. Farms	15	20
Buchanan Farm	54	57	Union	..	..
Central	65	73	United States	1 00	2 25
Clinton Oil	..	..	Sherman & Barnsdale	..	..
National	2 50	3 25	Second National	..	..
N. Y. and Alleghany	50	1 00	Bliven	..	..
Pithole Creek	1 25	..	Rathbone	..	..
Home Petroleum	4 00	5 50	Northern Light	..	..
Pacific Oil	..	..	Bergen Coal and Oil	..	..

State, R. R. and Other Bonds.—Tenn. St. 6s, ex. coup., 66; Tenn. St. 6s, new, 64½; N. Car. St. 6s, new, 53; Missouri 6s, 37; Mo. 6s, H. & St. J. Iss., 88½; N. Y. S. 7s B. Loan, reg., 109½; Ala. St. 5s, 70; Conn. 6s, 100; N. Y. C. 6s, '83, 91; do., 91½; Harlem 1st, 102; Mich. So. S. F. Bonds, 99; Hudson 3d, 100; Del., L. & W. 2d m., 91; Tol. & Wab. 1st ext'd, 91; G. Western 2d, 78½; Fourth Nat. Bank, 103½; West. Union Tel., 39@39½; N. Y. Central R., b, 3, 159½; Del. & Hudson Canal, 126; Quicksilver Mining, 20; Pacific Mail. S. c., 89@89½; Wells Fargo Ex., bet. call, 30½; Adams Ex, C. 58; Merchants Un. Ex., 15; Reading R., 91@91½; Mich. Cent., 118½; Chicago and Alton, s3, 149.

Government Bonds.—Governments have yielded slightly in response to the pressure in money and lower prices for Five-twenties at London, the only counteraction to this tendency being the advance in gold. The further decline in bond bills has also a tendency to depress prices.

U. S. 6s, 1881, coupon	115½@115	U. S. 5-20s, '65, new coup.	112⅝ 112¾
U. S. 5-20s, 1862, coupon	117⅛ 11	U. S. 5-20s, 1867, coupon.	112⅝ 112¾
U. S. 5-20s, 1864, coupon	113⅛ 113⅜	U. S. 5-20s, 1868, coupon.	112⅝ 112¾
U. S. 5-20s, 1865, coupon	115¼ 115½	U. S. 10-40s, ex. coupon	105 105½
Pacific R. R. 6 per ct. bds.	104 104½		

Foreign Exchange.—Foreign exchange is dull and lower, especially bond bills, which are so irregular as not to admit being quoted. We quote:

Lon. (pr. bks), 60 dys	107¼@108	Swiss	5.25 5.23¾
Lon. (pr. bks), sight	108⅜ 108¾	Hamburg	.. ..
London, prime com	.. ..	Amsterdam (bankers')	39⅞ 40
Paris (bankers'), long	5.25 5.23¾	Frankfort (bankers')	40 40⅛
Paris (bankers'), short	5.22½ 5.21¼	Bremen (bankers')	.. ..
Antwerp	5 27½ 5.25	Berlin (bankers')	70⅜ 70¾

Gold.—132@132½. The following are the quotations for other coin:

American silver	95 @ 95¼
Mexican dollars	103¼@104
English silver	480 @485
Five francs	95¼@ 96¼
English sovereigns	486 @489
Twenty francs	384 @386
Thalers	70½@ 71

Statement of business at the United States Assay Office, at New York, for the week ending March 31, 1869:

Deposits of Gold.	
Foreign coins	$9,000 00
Foreign bullion	45,000 00
United States bullion	466,000 00
Total Gold deposits	520,000 00
Deposits of silver, including purchases.	
Foreign coins	$22,000 00
Foreign Bullion	19,000 00
United States bullion (gold)	3,000 00
Do., old coins	1,000 00
Do., Colorado	9,000 00
Lake Superior	1,000 00
Nevada	9,000 00
Total Silver	64,000 00
Total deposits, payable in bars	500,000 00
Total deposits, payable in coins	84,000 00
Total	$584,000 00
Gold bars stamped	410,958 00

Petroleum.—Crude, in bulk, is steadily held, with sales of 600 bbls., at 18¼c. The market for refined is unsettled, with but few buyers for parcels for immediate delivery, and no inclination to force business; sales are 3,500 bbls., at 32c., and 500 bbls. for the balance of the month, at 32c. For Philadelphia delivery prices are nominal.

Receipts for the week ending March 30	pkgs	9589
Exports for the week ending March 30	galls.	1,421,316
Exports from Jan. 1	galls.	10,737,525
Exports same time last year	galls.	9,947,351

The following is the quantity exported from other ports, Jan. 1 to March 20.

	1869.	1869.
From Boston, galls.	654,828	577,132
Philadelphia	3,703,303	4,476,381
Baltimore	196,541	288,957
Portland	....	6,800
Cleveland	....	....
Total	4,544,672	5,349,270
Total exports from the United States	15,382,940	15,473,671
Same time in 1867		10,089,455
Same time in 1866		12,347,361

Copper has been very unsettled, with a limited business at 24c. for Baltimore and Detroit. The price declined under forced sales of small lots. The total sales do not amount to 400,000 lbs for the week. The quotation of today is 24 and 24½ for delivery the end of April and May.

Tin is very firm at 33c., gold, for Straits, 34c. for Banca, and 31½c. for English. The Dutch auction came off yesterday, and 49,300 slabs Banca tin were sold at 33 florins.

The English market advanced to-£133 for Straits. These quotations are 1½ per cent. above our market.

Spelter is dull at 6¼@6½c., gold, for Silesian.

Lead.—Dull at $6 30 for Spanish.

Zinc.—The price for Domestic Spelter is 12½c., currency; Sheet Zinc, 12½c., currency.

THE IRON TRADE.

New York, April 3, 1869.

The market is only characterized by extreme dullness. There is some inquiry for American Iron, but very little business at present prices. Most consumers are holding off expecting lower prices, the large stocks held by speculators which are to come on the market will help to lower prices. Sales are sn all and unimportant.

Scotch Iron remains quiet and in good demand, with no stock of moment. Prices are expected to rule high—350 tons Glengarnock so d at $42.

Scrap Iron is quiet. Wo note sales of 500 tons at dock on private terms.

Old Rails, sale 120 tons Old T on private terms, very quiet and with but little demand.

Bar from store continurs dull, the lower range of prices producing no increase in business.

Market Prices.

New York, April 2, 1869.

Duty.—Bars, 1 to 1½c. per lb.; railroad, 60c. per 100 lbs.; boiler and plate: 1½c. per lb.; sheet, band, hoop and scroll, 1½ to 1½c. per lb.; pig, $9 per ton, polished sheet, 3c. per lb. Payable in gold.

Am. pig, fy. No 1, best,	$40 00	@42	00
" " 2x frdy,	38 00	40	0
" Grey Forge	36 00	38	00
White and Mottled	32 00	35	00
Pure white for Cal. mar.	32 50	—	—
Scotch Pig, No. 1, best bd	40 00	43	00
" " " outside,	40 00	—	—
Wt. No. 1 Scrap f'm yd.	47 50	50	00
Ex ship	45 00	....	
Bar, Ref., En. & Am.	90 00	95	00
Bar. Sw's, as. sizes, gold	82 50	87	50
Old Rails	47 50	....	
R. R. Iron, For., fin Stock gold	54 50	55	50
R. R. Iron For., to imp.	55 00	00	00
" " Amer. at wks. currency	75 00	76	—
R. R. Iron, Am., deliv'd	78 00	80	00
Stt rails of any pattern at works, currency	....	....	
Solid Steel rls. For., gd.	95 —	—	—
Street Rails at works	85 00	—	—
Light rls. for mines &c. at works	$85 00	@—	—
Do. delivered here	....	—	—

STORE PRICES—Less 5 per cent.

Bar, Swades, ord'y sizes	— —	140	00
Bar, Eng. and Am., rf'd.	92 50		
Bar, Eng. & Afn., com.	85 00	92	50
Scroll	120 00	150	00
Ovals and half round	117 50	142	00
Band	117 50	—	—
Horse Shoe	117 50	—	—
Rods, ⅜@3-16 inck	100 00	155	00
Hoop	125 00	180	00
Nail Rod, per lb	8¾	9¼	
Sheet, Rus. as'd. Nos. (gold)	11¼	13	
Sheet, s'gle. D & T. com	5¾	7	
Rails, Eng., gold, ton	55 00	56	00
Rails, American at w'ks	74 00	76	00

STEEL.

English, cast 2d & 1st qual.	18	@22	
Eng. Spring 2d & 1st qual	9	11¼	
Eng. Blister 2d & 1st qual.	11¼	19	
English Machinery	12¼	15	
Eng German 2d & 3d qual.	14	16	
Am. Blister, "Black Diam'd,"	10¼	16	
American, Cast, Tool "	19	—	
American, Spring "	10	13	
American Machinery "	—	13	
American German "	10	13	

Lehigh Valley Iron Trade.

Pig Iron transported by the Lehigh Valley Railroad Co. for the week ending March 27, 1869:

From	Tons.	Total.
Carbon Iron do	165	....
Lehigh Valley Iron Co.	200	....
Thomas Iron do	1195	....
Lehigh Crane Iron do	990	....
Allentown Iron do	645	....
Robert Iron do	170	....
Glendon Iron do	565	....
Other Shippers	1180	....
Total	....	....

Pittsburgh, March 27, 1869.

The receipts of most descriptions of raw irons, reports the *Commercial*, continue light, particularly bituminous coal smelted from Lake Superior ore. A large portion of the irons that have been received are required to fill previous contracts, and this will, in a great measure, be the situation of the market for some weeks to come, as the February sales for 30 and 60 days delivery were large, hence the sales for immediate delivery must necessarily be light until previous contracts are complied with, the demand for standard forge irons being only moderate. In foundry irons there is a good demand and a strong feeling, and desirable grades readily command prices that were current at the date of our last report.

The stocks of charcoal irons, particularly Hanging Rock Foundry descriptions, are unusually light, and find ready purchasers at current prices. We are reported the following sales:

BITUMINOUS COAL SMELTED FROM LAKE SUPERIOR ORES.

50 tons low grade	$35 50	6 mos
150 tons favorite brands Forge iron	39 00	5 mos
100 tons good Gray Forge iron	38 50	5 mos
100 tons medium Gray Forge iron at Furnace	36 00	4 mos
100 tons medium Gray Forge iron at Furnace	36 00	4 mos
35 tons good Gray Forge iron	39 00	4 mos
30 tons Open Grey L. S. and Native Ore, Foundry	40 00	cash
200 tons Medium Gray Forge iron	35 50	5 &6m

CHARCOAL.

10 tons No. 1 Hanging Rock Foundry	45 00	cash
150 tons " "	45 00	4 mos
25 tons " "	45 00	4 &5m
270 tons Fancy brands Mo	51 50	4 mos
50 tons Extra Forge iron	49 00	4 mos

ANTHRACITE.

20 tons No. 2 Foundry	42 00	4 mos
20 tons No 2 Foundry	41 50	4 mos
10 tons No. 2 Foundry	42 00	cash

The card rates of iron and nails are unchanged. We quote as follows:

IRON.

Common bar sizes	3¼ to 4¼
Horse shoe	5½
Heavy band	4½ to 5¼
Hoop and light band	5 to 9½
Round and square	3¼ to 7¼
Oval	4½ to 5
Half oval and half round	4½ to 5½
Boiler iron	5½ to 9
Tank iron	5½

All sheets over 28in. wide, ¼c. per lb. extra.

Ffat rails, punched and countersunk	4½ to 4¾
T. rail, 12, 16, 20 and 25 lbs. to the yard	4 to 4¼
Nail rods	8½ to 10
Coal screen iron	5½ to 6½

	American.	Charc'l.	Juniata.
Sheet iron, 10 to 17	5½	6¼	9
Sheet iron, 18 to 24	5¾	7¼	9¼
Sheet iron, 25 to 26	6	7¼	9¼
Sheet iron, 27	6¼	7¼	10

All sheets over 28in. wide, ¼c. per lb extra.

Ironton, Ohio, March 26, 1869.

The Ironton *Register* says:—Holders are unable to fill the orders they receive. The production thus far this year does not seem to "fill up" any. Only very few of the furnaces are yet in blast. We quote this week:

Foundry, No. 1 Hot Blast	$43 00	@ 43 50
Foundry, No. 2 Hot Blast	41 00	42 50
Mill	39 00	@ 40 00
Cold Blast	55 00	60 00

Nails and bar iron are active at prices as at last week—$4 25 10d. for the former, and 3¾c. for bar. Orders do not decrease.

Olive Furnace is putting in new hot blast.

THE COAL TRADE.

New York, April 2, 1869.

The wholesale market was in a somewhat excited state on Wednesday. On Saturday and Monday last quite a panic prevailed. The city was besieged by numerous dealers who wanted from 50 to 300 tons of coal. They went from office to office in quest of what they knew was not to be had, and put on a face as though desiring from 1,000 to 5,000 tons. The trade here has a great peculiarity, which is, when there is plenty of coal for sale a buyer wants 50 tons; and when there is none, he wants 5,000 tons. That the coal trade was influenced by this class of buyers is evident from the small lots taken at the Scranton sale of Wednesday.

The following table exhibits the quantities of each size sold at the sale, and prices obtained, compared with last month's sale.

AUCTION SALE OF SCRANTON COAL—ADVANCE IN PRICES.

LUMP COAL.

3,750 tons at	$4 30
2,800 "	4 32½
3,000 "	4 35
2,450 "	4 37½

STEAMBOAT.

12,300 tons at	$4 45
1,700 "	4 47½

GRATE.

5,100 tons at	$4 45
8,050 "	4 47½
1,850 "	4 50

EGG.

8,900 tons at	$4 62½
100 "	4 65

STOVE.

2,800 tons at	$4 85
3,600 "	4 87½
1,950 "	4 90
1,500 "	4 92½
1600 "	4 95
5,450 "	5 00
100 "	5 05

CHESTNUT.

200 tons at	$4 30
2,000 "	4 32½
2,200 "	4 35
1,400 "	4 37½
1,850 "	4 40
2,450 "	4 42½

RECAPITULATION.

The following is a recapitulation compared with the sale of last month:

Tons	March 31.		Feb. 24.	
12,000 Lump	$4 30	@4 37½	$4 35	@4 40
14,000 Steamboat	4 45	4 47½	4 30	4 37½
15,000 Grate	4 45	4 50	4 32½	4 45
9,000 Egg	4 62½	4 65	4 20	4 30
20,000 Stove	4 85	5 05	4 50	4 80
10,000 Chestnut	4 30	4 42½	3 72½	3 85

We predicted in our last that there would be an average advance of from 40 to 50 cents per ton. Twenty-five cents per ton was realized, the difference being caused by a new set of drawbacks, issued on Monday by the Philadelphia and Reading Railroad, and, perhaps, by a private or confidential circular from the Pennsylvania Coal Company, both of which were sent forth to bear the market. The latter company, however, need not fear having any great influence in this market at any time, because dealers generally recognize a difference in quotations from a party that has no coal for sale and one that has. This thing has been too often tried on. The reason that Scranton coal brought the advance noted above was from the fact that the coal was needed, and it was certain of delivery. Could other and better qualities of coal have been procured in the market previous to the sale, last month's prices would hardly have been sustained.

The new drawbacks by the Philadelphia and Reading Railroad are as follows:

	1869.	1868.	Decrease, 1869.
Lump	$1 10	$1 25	15
Steamer	1 00	1 15	65
Broken	1 00	1 00	—
Egg	1 00	65	45
Stove	75	50	25
Chestnut	90	75	15

It is not expected that these low rates will hold out after a general strike, which is inevitable, has taken place. In all probability, they were only issued for a few days, and for the purpose set forth above.

The 80,000 tons of coal sold on Wednesday seems to have satisfied some of the hungry ones, and the market to-day is less feverish and excited, although coal is still scarce for immediate delivery.

"That committee" which we have noticed from week to week as endeavoring to arrange *something*, to the *advantage* of the general coal trade, has gone up in a balloon, because it could not agree upon some *special advantage* to the ——— (we forbear this time as we don't like to advertise the company free). Let it suffice. They adjourned. Mr. Parish has gone home, Mr. Dickson has secured a pious retreat in Scranton, and Mr. Sloan looks very good-natured in his office at 26 Exchange Place.

We will not quote prices for April until next week. Many of the companies have not yet made them up. The Lehigh men fix theirs on Tuesday next.

Freights remain unchanged; the Hudson is open, but little toal has been sent.

The following will show the exports of coal from the port of New York for the week ending March 30, and for the season to that date, also the amount exported last year for the some period;

Exports for the week	tons	
Do. from January 1	do	15,176
Do. same time last year		11,741

Philadelphia, April 1, 1869.

The market is excited, with rumors of a general strike on the 15th. The Reading Railroad have changed their drawbacks from April 1st until further notice. Lump and Steamboat $1 10, Broken and Egg $1 10, Stove 75 cents, Chestnut 90 cents. If the strike is general the prices on drawbacks will change, probably before the 1st of May. The Lehigh Coal and Navigation Company have arranged their tolls and freights. Tolls to Philadelphia 72 cents, freights $1, towage 8 cents, making a total of $1 80 per ton. Freights by rail to New York from Mauch Chunk 1¼ per ton per mile, which is a reduction of 55 cents from the last rates.

The following table exhibits the amount of Coal that was passed over the various routes of transportation from the Pennsylvania Coal districts for the week ending March 27, 1869, and for the season to that date. A comparison is also made with the amount transported the corresponding week in 1868, showing the increase or decrease, as the case may be:

	1868.		1869.		INC. OR DEC.	
COMPANIES,	WEEK.	TOTAL.	WEEK.	TOTAL.	WEEK.	YEAR.
Phil. & Read. R. R.	56,701	663,537	55,470	672,706 d	1,281 i	9,179
Schuylkill Canal	....	....	17,283	25,072	....	....
Lehigh Valley R. R	46,398	595,314	46,082	659,006 d	926 i	63,490
Lehigh & Sus. R. R	12,264	73,893	18,056	207,726 i	4,792 i	130,883
*Lehigh Canal	....	....	....	....	....	....
Scranton North	7,293	89,872	9,733	117,867 i	2,440 i	27,990
Scranton South	22,200	240,914	29,633	354,012 i	7,431 i	114,098
Penn. Coal Co. rail	13,292	127,573	10,811	160,732 d	2,481 i	32,869
*Penn. Coal Co. can.	....	....	....	....	....	....
*Del. & Hud'n Can.	....	....	....	....	....	....
Shamokin	6,864	78,823	5,072	75,561 d	1,791 d	2,962
Trevorton	364	13,967	523	4,909 i	159 i	942
Short Mountain	2,049	1,039	2,109	11,040 i	050 d	001
Lykens Valley Co.	1,604	9,853	1,200	9,823 d	402 d	10,030
Hunt'g'n & B'd T'p	4,772	26,561	5,661	68,866 i	889 i	32,305
*Wyoming South	....	....	....	....	....	....
*Wyoming North	....	....	....	....	....	....
Williamstown Col.	2,990	28,648	4,748	33,950 i	1,757 i	5,232
Total	176,831	1,970,466	206,884	2,401,610		
1868			176,831	1,970,466		
			30,553 i	431,144		

*Closed.

Schuylkill Coal Trade.

BY RAILROAD AND CANAL, FOR WEEK ENDING, MARCH 18.

	RAILROAD.	CANAL.
St. Clair	26,545	....
Port Carbon	7,079	6,942
Pottsville	2,602	307
Schuylkill Haven	21,581	8,224
Auburn	1,006	....
Port Clinton	10,510	549
Company's use	4,967	....
Total for week	74,250	15,572
Previously this year	672,716	25,072
Total	746,936	40,644
Same time last year	728,409	
Increase	18,467	

Report of Coal Transported over Lehigh Valley Railroad

For the week ending March 27th, 1869, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt
WYOMING REGION.		
Franklin Coal Co	....	13,895 18
Audenried	....	
Lehigh and Susquehanna	....	
Germania Co	....	
Wilkesbarre Coal & Iron Co	....	595 15
Warrior Run	390 18	5,886 06
Parrish & Thomas	....	3,062 18
New Jersey	315 17	4,650 07
Union Coal Co	....	....
Wyoming Coal & Transportation Co	....	11,044 03
Newport Coal Co	....	....
Morris & Essex Mutual Coal Co	....	....
Consumers	....	....
Everhart Coal Co	....	....
Plymouth Coal Co	....	....
Hillman & Son	371 13	5,845 03
Bowkley, P & Co	....	44 18
Mineral Spring	349 07	8,753 10
Valley Coal Co	....	....
Enterprise Colliery	1,741 06	27,702 13
Burroughs	937 09	10,462 05
Washington Coal Co	....	....
West Pittston	....	180 16
Barclay Coal Co	....	....
Shawnee	168 17	5,442 15
Consumers Coal Co	....	4,890 02
Chas. Hutchinson	162 15	405 00
Harvey & Bro	29 17	1,397 13
Wyoming Valley	341 09	6,899 06
Henry Colliery	....	....
Fall Creek	....	....
New England	500 07	6,935 06
Delaware & Hudson Coal Co	25 07	4,829 11
Maltby Colliery	20 18	1,344 07
Gaylord Colliery	....	....
Butler, H S M		
Tompkins	....	627 19
Chauncey Colliery	147 03	5,230 08
Ravine Colliery, P & E	....	....
Maryland Anthracite	....	415 11
Rough & Ready	....	291 06
Rock Tunnel	....	....
Butler Colliery	....	3,835 09
Other Shippers	....	29 06
Total Wyoming	5,503 02	134,698 04

Same time last year	6,495 08	78,223 01
Increase	...	55,475 03
Decrease	992 06	....
HAZLETON REGION.		
Central Coal Co	....	....
Ashburton Colliery, R. R. Carter	374 09	5,348 17
Mount Pleasant	415 01	5,618 16
Hazleton	7,402 06	70,216 06
Stockton—East Sugar Loaf	4,138 01	49,818 10
Mount Hall	....	....
Latimer (A Pardee, Jr., Bro & Co.)	1,936 15	26,458 10
Stout Coal Co	972 15	13,981 02
Harleigh	1,906 14	30,889 00
Evervale Coal Co	2,793 14	25,655 11
Jeddo, (G B M & Co)	....	38,364 04
Woodside, J C Co	65 13	5,052 07
Highland Coal Co	....	4,347 07
Cross Creek	892 19	12,234 03
Council Ridge	2,491 15	39,873 01
Buck Mountain	697 07	21,701 12
Other Shippers	....	114 10
Total Hazleton	24,087 10	349,673 15
Same time last year	19,231 09	280,052 00
Increase	4,856 01	69,621 14
Decrease	....	.. .
UPPER LEHIGH REGION.		
Upper Lehigh Coal Co	806 13	6,014 15
Same time last year	1,465 10	20,673 03
Increase	....	....
Decrease	1,158 17	14,658 05
B. M. REGION.		
Spring Brook	2,751 09	15,932 04
Honey Brook	2,993 02	25,864 04
German Pa. Coal Co	825 04	6,478 13
Spring Mountain	2,926 06	29,855 04
Coleraine	1,313 11	18,912 14
B. Meadow, D. W	....	61 01
John Connery	....	....
Lehigh Zinc Co	....	....
Stafford D W	74 05	668 11
Other Shippers	6 12	177 02
Total B M Region	10,890 09	97,949 13
Same time last year	9,315 13	102,410 11
Increase	1,574 15	....
Decrease	....	4,460 18
MAHANOY REGION.		
Mt Rose Coal Co	34 07	334 08
Mount Etna	121 08	121 08
Mahanoy Colliery	1,396 08	7,333 10
Coplay Colliery	1,457 19	13,237 15
Glendon Colliery	143 08	5,076 12
Primrose Colliery	....	6,968 19
E S Silliman	1,611 17	9,413 11
McNeal Co	....	1,605 07
Knickerbocker	17 03	2,877 02
Thomas Coal Co	....	....
Mammoth Vein	....	997 18
New Boston Coal Company	194 09	6,597 00
Coal Mountain	....	613 16
Shamokin Coal Company	....	....
Caledonia M & M	317 15	4,245 13
Richards & Humphreys	....	35 00
Other Shippers	....	9 17
Total Mahanoy	5,294 14	59,467 14
Same time last year	9,844 12	104,831 00
Increase	....	....
Decrease	4,549 18	45,363 06

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	PREVIOUSLY Tons. Cwt.	TOTAL. Tons. Cwt.
Total Mahanoy	5,294 14	54,173 00	59,467 14
Total B. Meadow	10,890 09	87,059 04	97,909 13
Total M. Chunk	....	32 03	32 03
Total U. Lehigh	306 13	5,708 04	6,014 18
Total Hazleton	24,087 10	325,586 05	349,673 15
Total Wyoming	5,503 02	129,195 02	134,698 04
Total	46,082 08	601,758 19	647,836 07
To L. & S. R., at Penn Haven for rail.	....	4,174 00	4,174 00
Do. for Canal	....	4,184 06	4,184 06
At Mauch Chunk for canal	....	2,259 07	2,259 07
Total Anthracite	46,082 08	612,371 12	658,454 00
Susquehanna region Bit.Coal, F. C'k.	....	552 03	552 03
Total by rail and canal	46,082 08	612,923 15	659,006 03
Same time last year	46,378 09	549,136 00	595,514 09
Increase	....	63,787 15	63,491 14
Decrease	296 01	....	....
Forwarded east from M. Chunk by r'l	44,375 01	579,587 00	623,962 01
Same time last year	46,352 12	540,837 03	587,189 15
Increase	....	38,749 17	36,772 06
Decrease	1,977 11	....	....
RECAPITULATION.			
Forwarded east from M. Chunk by r'l	44,375 01	579,587 00	623,962 01
Delivered at Mauch Chunk	41 16	453 02	494 18
Del. on line of r'd above M. C'k	143 07	3,585 06	3,728 13
Del. ab. M. C. for use of L. V. rail'd.	1216 19	15,184 00	16,400 19
To L. & S. r'd at Penn Haven for rail	....	4,174 00	4,174 00
Do. for shipm't by canal	....	4,184 06	4,184 06
At Packerton	78 10	1,854 07	1,932 16
At M. Chunk for shipmen. by canal	....	2,259 07	2,259 07
To N. C. R. R., at Mt. Carmel	266 15	1,642 07	1,869 02
Total	46,082 08	612,923 15	659,006 03

Lehigh and Susquehanna Railroad.

Report of Coal shipped for week ending March 27, 1869.

WHERE FROM	WEEK. Tons. Cwt.	TOTAL. Tons. Cwt
WYOMING REGION.		
Newport Coal Co	....	....
Albright, Roberts & Co	342 04	708 02
New England Coal Co	....	21 07
Morgan Mines	....	....
Warrior Run Mining Co	...	....
Parrish & Thomas	....	3,579 01
New Jersey Coal Co	369 10	3,479 01
Gaylord Mines	....	....
Delaware & Hudson Canal Co	1,708 00	15,646 16
Lehigh & Susquehanna Coal Co	....	....
Germania Coal Co	437 09	5,009 11
Franklin Coal Co	....	....
Audenreid Improvement Coal Co	....	....
Wilkesbarre Coal & Iron Co	7,181 10	57,447 18
Union Coal Co	....	....
Mineral Spring Coal Co	408 08	3,849 13
H. B. Hillman & Son	285 17	1,681 01
Bowkley, Price & Co	....	682 19
Wyoming Coal & Transportation Co	....	1,108 08
Henry Colliery	51 06	3,360 16
J. H. Swoyer	....	....
Everhart Coal Co	....	5,923 16
Morris & Essex Mutual Coal Co	....	....
Shawnee	....	1866 13
Pine Ridge Colliery	1,148 16	4,886 15
Lances Colliery	....	200 07
Consumers Coal Co	....	15 15
Harvey Brothers	....	....
Lehigh & Luz. Coal Co	279 03	10,450 13
Other Shippers	....	....
Total Wyoming Region	12,162 19	119,448 12
UPPER LEHIGH REGION.		
Upper Lehigh	2,618 13	37,391 03
Other Shippers	....	....
Total Upper Lehigh Region	2,618 13	37,391 03
HAZLETON REGION.		
A. Pardee & Co	67 10	498 05
Linderman & Skeer	....	25 05
Sharpe, Weiss & Co	....	205 17
Wm. Taggart	16 03	271 07
Harleigh Coal Co	....	127 05
G. B. Markle & Co	....	182 12
Ebervale Coal Co	....	99 01
Stout Coal Co	....	99 13
Buck Mountain Coal Co	....	....
Coxe Brothers & Co	....	83 03
Ashburton Coal Co	....	....
Highland Coal Co	....	....
Pardee Brothers & Co	....	63 05
Jeddo Coal Co	....	133 15
Mount Hall (J. s. s.)	....	....

R. R. Carter	....	33 14
Other Shippers	....	73 14
Total Hazleton Region	116 13	1,723 06
MAUCH CHUNK REGION.		
Lehigh Coal & Navigation Co	....	....
Summit Mines	3,158 05	44,550 02
Room Run Mines	....	5,994 17
Other Shippers	....	....
Total Mauch Chunk	3,158 05	49,544 19
" Mauch Chunk Region	3,158 05	49,544 19
" Hazleton	116 13	1,723 06
" Upper Lehigh	2,618 13	37,009 16
" Wyoming	12,162 19	119,448 12
Grand Total	18,056 10	207,726 03
Corresponding week last year	12,264 04	73,843 12
Increase	4,792 06	133,883 01
Decrease	....	....
Forwarded South from Mauch Chunk by Rail	16,993 14	188,109 07
Delivered on line of L. & S. R. R. ab've M'ch Ck	595 14	8,247 13
Delivered to Lackawanna & Bloomington Railroad at Plymouth Bridge	467 02	6,004 10
Delivered to L. V. R. R. Co, at Sugar Notch	....	4,898 01
Delivered at Coal Port for shipment by canal	....	....
Total	18,056 10	207,726 03

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

At New York, March 10, 1869.

Schuylkill R. A., choice	$	$....	Schuylkill Chestnut	$....	....
" Ordinary	....	....	Lehigh W. A. L'p old Co.	....	....
" W. A. Lump	....	....	" Broken	....	....
" Steamboat	....	....	" Egg	....	....
" Broken	....	....	" Stove	....	....
" Egg	....	....	" Chestnut	....	....
" Stove	....	....	Shamokin	....	....

SPECIAL COALS.—DEALERS' QUOTATIONS.

Diam'd Vein R.A., Sch'kill	....	....	Old Co.'s W. A. Lehigh	....	....
Locust Dale W. A., "	....	....	Mt. Pleasant	....	....
Honey Brook " Lehigh	....	....	Buck Mountain	....	....
Harleigh " "	....	....	Fulton	....	....
Spring M'n " "	....	....	Stout	....	....
Sugar Creek " "	....	....	New England Red Ash	....	....
Sugar Loaf " "	....	....	Wyoming	....	....

Dealers in these Coals may be found in our advertising columns.

At Philadelphia, April 1, 1869.

Lehigh L'p and St'mb't	6 00		" Egg and Stove		
" Broken and Egg	6 00		" Chestnut		
" Stove	6 25		Locust Mount Lump	4 00	4 25
" Chestnut	5 50		" Steamboat	4 00	4 25
Schuylkill R. A			" Broken	4 00	4 25
" Chestnut			" Egg	4 00	4 25
" W. A. Lump			" Stove	4 25	4 50
" Broken			" Chestnut	3 50	4 50

SPECIAL COALS.

Lorberry Coal	5 00	5 25	Burnside R. A. Egg & St.	4 75	5 00
Shamokin	4 75		Powelton Coal Co	5 00	
Franklin, (Lykens Val.)		5 25	Hill & Harris, Egg & St.		4 50
Broad Top	....	5 00	Henry Clay, Egg & St.	4 50	4 75

Dealers in these coals may be found in our advertising columns.

Powelton Coal at Philadelphia, March, 1869.

Powelton Egg and Stove	$5 00	Powelton Gas	$7 80
Powelton Semi Bituminous	5 00		

Scranton Coal at Elizabethport, March, 1869.

(Corrected weekly by D. L. & W. R. R. Co.

Lump	....	Egg	....
Steamer	....	Stove	....
Grate	....	Chestnut	....

Prices for Pittston Coal at Newburgh, March, 1869.

(Corrected weekly by Penna. Coal Co.)

Lump, per ton, 2240 lbs	....	Egg " "	....
Steamer, " "	....	Stove " "	....
Grate " "	....	Chestnut " "	....

70c. Freight to New York.

Lackawanna at Rondout, March, 1869.

Lump	....	Egg	....
Steamer	....	Stove	....
Grate	....	Chestnut	....

65 cents Freight to New York.

Lehigh Coal at Mauch Chunk.

March, 1869.

Lehigh L'p and Steamboat	$....	Stove	$....
Broken and Egg	....	Chestnut	....

$2 35 Freight to Philadelphia.

Lehigh Coal at Elizabethport, March, 1869.

Lump	....	Stove	....
Steamboat and Broken	....	Chestnut	....
Egg	....		

50c. Freight to New York.

Wilkesbarre Coal at Hoboken, March, 1869.

(Corrected by Wilkesbarre Coal & Iron Co.)

Lump	....	Egg	....
Steamer	....	Stove	....
Broken	....	Chestnut	....

45 cents Freight to New York.

At Baltimore, March, 1869.

Wholesale prices to trade.		Trevorton R. A	$6 25 6 50
Wilkesbarre by cargo or car load	$6 60 @6 80	By retail, per ton of 2,240 lbs., delivered	8 75 9 25
Pittston and Plymouth	6 25 6 75	Georges C'k & Cumberland f. o. b. at Locust Point for shipping	.... 5 00
Shamokin R., or W. Ash	6 25 6 50		
Lykens Valley, R. A	.... 6 85		

At Havre de Grace, Md.

Cargo prices for shipment south of Patapsco River, (drawback allowed of 10 per centum.)		Shamokin R. or W. Ash	$.... @....
		Lykens Valley R. A	....
		Trevorton R. A	....
Wilkesbarre and Pittston W. Ash	$.... @....		

At Georgetown, D. C. and Alexandria, Va.

George's Creek and Cumberland f. o. b. .... @4 75

Prices of Gas Coals.

March, 1869.

PROVINCIAL. Duty, $1 25	Coarse. Gold.	Slack. Gold.	AMERICAN.	Coarse. Currency.	Slack. Currency.
Block House	$1 75 @$	75	Westmoreland Co	$8 50	$8 00
Gowrie	1 75	75	Despard Coal Co	8 50	8 00
Lingan	1 75	75	Penn	8 50	8 00
Sydney	2 13½	71½	Newburgh Orrel Gas	8 50	8 00
Picton	2 13½	1 18½	West Fairmont Gas Coal	7 00	
Little Glace Bay	1 75	1 00	Powelton Gas Coal	8 00	7 00
Caledonia	1 60	75			

Prices of Foreign Coals.

March.

Duty, $1 25 per ton.

Corrected weekly by PARMELEE BROS., 32 Pine Street, N. Y.

Liverpool Gas Caking	$ 9 50	Liverpool House Canne	18 00 19 00
" " Cannel	14 00	" " Orrel	16 00 18 00

Per ton 2240 lbs., Ex. ship.

PRICES FROM YARD.

Liverp'l House Orrel, scr'd	$16@18	Liverp'l House Can'l, scr'd	$18 00 20 00

Per ton 2000 lb., delivered.

Coal Freights.

(Corrected Weekly).

Freights on Coal Sea-borne from Port Richmond, Philadelphia.

March 18, 1869.—From Philadelphia and Reading R. R. Wharves, Phila., to

Bangor	....	....	New London	— —	1 80
Boston	2 00	2 50	Dover	— —	2 50
Providence	....	2 00	Cohasset Narrows	— —	2 50
Lynn and discharging	2 50		Cambridgeport	— —	2 75
Portland	2 00	2 50	Dorchester	— —	2 50
Fall River	2 00		Fair Haven	— —	2 00
New Bedford		2 00	Gloucester	....	2 75
Salem	....	2 00	Lawrence	— —	3 00
Newport	— —	2 00	Old Cambridge	— —	2 53
East Cambridge	— —	2 50	Saco	— —	2 75
Newburyport	— —	2 50	Roxbury	— —	2 75
Portsmouth	— —	2 50	Salisbury	— —	2 75
Charleston	1 75	2 00	Greenport	— —	2 00
Danversport and discharging	2 50		Norwich	— —	2 00
Amesbury	— —	2 75	Harlem	— —	1 45
Beverly	....	2 50	New Rochelle	1 80	1 40
Charlestown	....	2 50	Sag Harbor	— —	1 50
Hingham	....	2 50	Spuyten Duyvel	— —	1 35
Marblehead	....	2 50	Williamsburg	— —	1 35
Nantucket	— —	2 50	Jersey City	— —	1 35
Plymouth	— —	2 50	New Brunswick	— —	1 20
Provincetown	— —	2 25	Alexandria	— —	1 25
Washington	— —	1 40	Fredericksburg	— —	2 00
Calais	— —	2 75	Wilmington, Del	— —	75
Machiasport	— —	2 75	Bath	....	2 50
Hoboken	....	1 35	East Greenwich	....	2 00
Hyannis	....	2 25	Albany	....	1 95
Malden	....	275	New York	....	1 35
Nahant and discharge	2 50		Troy	....	1 95
Weymouth and towing	2 50				

Provincial Freights.

TO NEW YORK.	$	TO BOSTON.	$
Sydney		Sydney	
Lingan		Lingan	
Cow Bay		Cow Bay	
Port Caldonia		Port Caldonia	
Little Glace Bay		Little Glace Bay	

From Elizabethport and Port Johnson.

Albany	$ ...@—	—	New London	$1 25	— —
Boston	1 75	2 25	Newport	1 40	— —
Bridgeport	1 15	— —	New York	50	— —
Fall River	1 40	— —	Norwalk	1	— —
Hartford		— —	Norwich	1 30	— —
Hudson		— —	Pawtucket and towing		— —
Wareham		— —	Portland	1 75	
Middletown		— —	Portsmouth	2 00	
New Bedford	1 55	— —	Providence	1 40	— —
Newburyport	2 00	— —	Salem	1 75	— —
New Haven	1 15	— —	Augusta	3 00	— —
			New Orleans	2 70	2 80

Foreign Freights.

New Castle and Ports on Tyne	£15@£18 keel.		
Liverpool	12s. 6d.@15s. ton.		
Australian	9 50@10 00	Lehigh	15 50@16 00
do. Wallsend	10 00 10 50	Liverpool	13 00 ....
Bellingham Bay	11 00	Pittston, ton	14 50 15 00
California	7 00 9 00	Scranton	14 00 15 00
Cumberland cks	30 00 32 00	Scotch	13 00 ....
do bulk	28 00	Vancouver Island	12 50 ....
Chili	10 00		

Rates of Transportation to Tide Water.

[BY RAILROAD.]

To Port Richmond, Philadelphia.

Philadelphia and Reading Railroad, from Schuylkill Haven $2 00

The following are the drawbacks allowed on all coal shipped East of New Brunswick and South of Cape Henry, until further notice.

	Drawback.	Freight.	Nett
Lump	1 10	$2 ..	$0 90
Steamboat	1 10	2 ..	90
Broken	1 00	2 ..	1 00
Egg	1 00	2 ..	1 00
Stove	75	2 ..	1 35
Chestnut	90	2 ..	1 10

From Port Carbon, 8 cents per ton more.

To Elizabethport.

L. V. Railroad from Mauch Chunk to Easton	$ 1 04
C. R. R., N. J., Easton to Elizabethport	1 55
	2 59
Shipping Expenses at Elizabethport	25
Total	2 84

To Port Johnson.

L. V. R R	$ 1 04
C. R. R. of N. J	1 63
Shipping Expenses	25
Total	2 92

To Hoboken.

L. V. R.R	1 04
Morris & Essex R.R	1 63
Shipping Expenses	25
Total	$2 92

NEW PUBLICATIONS.

We have received from the Board of Managers of the New Jersey Geological Survey the Geology of New Jersey, 899 pages large octavo, illustrated by 108 photolithographic engravings and wood-cuts, and six mine maps; and accompanied by a portfolio containing the following maps, in sheets:—1. *Azoic and Paleozoic Formations*, including the Iron-ore and Limestone districts; 2. *Triassic Formation*, including the Red Sandstone and Trap-rocks of Central New Jersey; 3 *Cretaceous Formation*, including the Greensand Marl Beds; 4. *Tertiary and Recent Formations* of Southern New Jersey; 5. *Map of a Group of Iron Mines* in Morris Co.; 6. *Map of the Ringwood Iron Mines*; 7. *Map of the Oxford Iron-ore veins*; 8. *Map of the Zinc Mines*, Sussex County. The price of the book and portfolio of maps is $6. The Geology of New Jersey, as above, without portfolio of maps, but containing a folded and colored map of the State, on a scale of 5 miles to 1 inch, costs $4. Single copies of either of the above maps, colored and in sheets, may be had for 50 cents. The Geological Map of New Jersey, on a scale of 2 miles to 1 inch, colored and mounted on rollers, giving the geology of the State the same as Maps 1, 2, 3, 4 in the portfolio, and essentially these combined in one map, 5½ by 7½ feet in size, is for sale at $8 per copy. The prices are fixed to merely cover the cost of paper, printing and binding; the expenses of the survey and preparing books and engravings being paid by the State. These publications can be had from Prof. GEO. H. COOK, State Geologist, New Brunswick, N. J., on remitting the price, or through the booksellers.

We shall take an early occasion to express at length our views concerning Prof. COOK's elaborate and handsome report; and we therefore content ourselves at present with acknowledging its receipt and thanking the authorities of New Jersey, in the name of the scientific public, for the liberality with which this valuable publication has been put within general reach. Their judicious course is equally removed from the mistaken generosity, on the one hand, which sends such works as public documents into the hands of those who do not appreciate their value; and from the niggardly policy, on the other hand, which makes them so costly as to place them beyond the purses of scientific workers.

We learn that the "Author's Edition" of Prof. W P. BLAKE's report on the precious metals, recently noticed by us, is published by GEO. P. PUTNAM & SON, of this city. The number of the Paris Exposition reports printed by Congress is quite small, and many who fail to obtain this one from Washington will be glad to know that it can be procured from the above house. Besides, this "Author's Edition," being later than the regular public one, contains some additional matter of recent date and general interest.

GEO. P. ROWELL & CO.'s AMERICAN NEWSPAPER DIRECTORY, *containing accurate Lists of all the Newspapers and Periodicals published in the United States and Territories, and the Dominion of Canada and British Colonies of North America.* New York: GEO. P. ROWELL & Co., 1869.

This is a handsome octavo volume, the object of which is sufficiently indicated by its title. It is evidently of great value to advertisers and those connected with the press.

☞ An excellent indelible ink may be prepared by rubbing up one drachm of aniline black with a mixture of sixty drops of concentrated hydrochloric acid and one and a half ounces of alcohol. The resulting deep blue liquid is then to be diluted with a hot solution of one and a half drachms of gum arabic in six ounces of water. This ink does not corrode a steel pen, and is affected neither by concentrated mineral acids nor by strong ley. If the aniline black solution be diluted with one and a half ounces of shellac, dissolved in six ounces of alcohol, instead of with the gum water, an aniline black is obtained, which, after being applied to wood stained black, brass or leather, is remarkable for its extraordinary deep black color.

AMERICAN

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DESIGNING, LITHOGRAPHING, WOOD ENGRAVING, and JOB PRINTING

Executed in elegant style, on reasonable terms.

NEW AGENCY.—GEO. E. CUMMINGS has been appointed our sole agent in Philadelphia, Pa., for the AMERICAN JOURNAL OF MINING, our new paper, the MANUFACTURER AND BUILDER, and our Spanish paper, EL CORREO HISPANO-AMERICANO. His address is 154 South Fourth street, Philadelphia, Pa., where all information respecting communications, subscriptions and advertisements for these papers will be gladly given to those who may wish to favor us with a call.

IN MAKING remittances for subscriptions, always procure a draft on New York, or a *Post Office Money Order*, if possible. Where neither of these can be procured, send the money, *but always in a registered letter*. The registration fee has been reduced to *fifteen cents*, and the present registration system has been found by the postal authorities to be virtually an absolute protection against losses by mail. *All* Postmasters are obliged to register letters whenever requested to do so.

☞ Correspondents, exchanges and others addressing us should be *extremely careful* to write "JOURNAL OF MINING," instead of "MINING JOURNAL," and to give the number of our Box at the Post Office, which is 5969, to ensure safe carriage. Communications intended for publication should be plainly written, and on one side of the paper only.

NEW YORK, SATURDAY, MARCH 27, 1869.

CONTENTS OF THIS NUMBER.

EDITORIALS.—Ancient Cement and Hydraulic Mining—A Little Learning—"Scientific" Trifles—Family School Abroad.
ORIGINAL PAPERS.—Sand, Geologically, Chemically, and Technically considered, by Dr. Lewis Feuchtwanger.
ILLUSTRATIONS.—Railroad Drill.
PRACTICAL LETTERS.—Ventilation.
SCIENTIFIC MEETINGS.—Polytechnic Association of the American Institute.
CORRESPONDENCE.—Missouri Tin—Diamonds in Georgia.
MISCELLANY—Underground—Wholesome Meat—Rock Drills, etc.
MINING SUMMARY.—GOLD & SILVER: Nevada—Gleanings from Mr. Raymond's Report—Texas—Michigan.—COPPER: Michigan.—LEAD: Illinois.—TIN: Oregon.—IRON: Wales.
NEW PUBLICATIONS.
ANSWERS TO CORRESPONDENTS.
REVIEW OF THE IRON TRADE.
REVIEW OF THE COAL TRADE.
MINING AND OTHER STOCKS.
METAL MARKET.

NOTICE TO CORRESPONDENTS.

In consequence of a new regulation recently adopted by the Postmaster of this city to facilitate the early delivery of mail matter, we have to requeet our correspondents, in addressing us, to give the number of our post-office box, No. 5,969, in lieu of, or in connection with our business office address.

ANCIENT CEMENT AND HYDRAULIC MINING.

Mr. WENDELL PHILLIPS, in his famous lecture on the Lost Arts, which has been for years the delight of literary societies and lyceums, proves that the ancients had almost all the arts upon which we pride ourselves as modern, and others besides, which we have thus far been unable to recover from oblivion. In the arts of mining and metallurgy, it must be admitted, the most numerous steps of progress have been improvements merely in matters of detail; and the general principles of those arts have suffered but few changes, though these few have been important. The introduction of explosives, the employment of steam, and the thorough study of ventilation are among the great advances we have made. But it is almost ludicrous to observe, in the rude wood-cuts of AGRICOLA, how little our whims, buckets, timbering, stamps, tools, furnaces, ore-dressers, etc., differ from those in vogue hundreds of years ago; and, going still further back, we may find many things in the mining of the more ancient peoples to remind us of our own.

In one remarkable instance we have returned to a method of extraction which was in vogue long before the invention of gunpowder, and which in its present form is claimed as an American "invention." The term invention, by the way, is compounded of two Latin words, and has the etymological signification, *to come upon* something (that some one else has dropped). In this sense, the theory of cement and hydraulic mining is an American invention; but how much absolute originality can be claimed for it, a few paragraphs, taken from the writings of PLINY, will show.

That Roman writer describes a method of ore-extraction which he calls "arrugea," and which was practised in Spain on a vast scale, at great expense. It consisted in first undermining the whole of a mountain, then allowing it to cave in, and finally washing out the valuable minerals thus exposed. The writers of later times, commenting on this method of proceeding, regarded it as astonishing by virtue rather of the immense labor and expense it involved, than of any particular excellence in principle, or accuracy, completeness and economy in result. In fact, they condemned it as rude and wasteful—charges which might possibly be made against our similar American methods. But the Romans, like ourselves, finding that by this process they could secure immediate gain, shrewdly declined to wait for science to discover a more perfect way. The treasures in the rocks were to them mere promissory notes, due at some indefinitely remote period. The sums which they wasted by incomplete methods were but the discounts, gladly paid, to secure the cash down, instead of the barren notes. No matter how heavy the "shave"—posterity, Visigoths, Moors and what not, might look out for that.

In carrying out the "arrugea," the mountain selected was first undermined by the labor of innumerable men. Their means of penetrating the rock consisted in hammers, drills, gads or wedges, and now and then pick-axes of huge size. These they assisted with fire, heating the rock, in order to soften it; and the effects of the fire were enhanced by the use of water and vinegar—the latter being especially efficient upon limestone. Under these circumstances, of course their progress was slow, and many months were consumed in excavating the mountain and removing all the loosened material. During this work, the premature fall of the overlying mass was prevented by means of rock-pillars, left standing in the mine. Finally, these pillars also were hewn away, at much risk to life, and the mountain fell with a great crash. A sentinel, placed on the outside, observed the first appearance of fissures, and signalized this fact to the miners under ground—after which, *sauve qui peut*.

These dangerous and costly operations were followed by others not less complicated and wonderful, having for their object the separation of the gold-ores from the *debris* of rock. Brooks and rivers were conducted, sometimes from great distances, to the locality, that their united volume might be employed in washing away the earth and waste rock. No difficulties were too great for these ancient engineers. Valleys were crossed with aqueducts; hills were pierced with tunnels; the waters thus brought together were at last collected in tanks, two hundred feet wide and ten feet deep, and from these precipitated upon the broken masses of the mountain with such force that even large boulders were moved by the stream.

But since so powerful a current would unavoidably carry away also many particles of gold, the water was again collected below in many wooden channels, the bottoms of which were covered with a certain plant, called *Ulex*, resembling our rosemary. This rough plant answered the purpose now served by coarse blankets in the sluices of California. It caught and held the particles of gold, and these were finally obtained by drying and burning the herb.

This method of mining was not confined to Spain. To judge from the remaining traces, it was practised in Hungary and possibly also in England. The stream tin works of Cornwall are not altogether unlike it. But the closest parallel in modern times is afforded by the cement and hydraulic mining of California. If the Romans had possessed gunpowder, the two systems would be identical.

"A Little Learning."

An amusing illustration of the truth of the poet's warning occurs in a recent issue of the London *Mechanics' Magazine*. In a series of articles on "Caps and Cartridges," taken largely, if not entirely, from French sources, the writer has occasion to translate the French terms, *cuivre rouge* and *cuivre jaune*, which, as most educated technologists know, mean simply pure copper—literally, red copper—and brass or yellow copper. The translator aforesaid, however, cannot see how copper can be red or yellow without being oxidized; and therefore appends what he is pleased to call the chemical formula for these forms of copper—making them in both cases Cu^2O. When we recollect that all the oxides of copper are brittle, crystalline substances, the absurdity of using any of them, as indicated in the articles to which we refer, is evident. The proposition is nothing less than to *roll out* red oxide of copper into thin sheets, for the purpose of making cases for caps or cartridges! The *Manufacturer and Builder* for March contains a revised version of the article from the *Mechanics' Magazine*, which that journal would do well to republish.

"Scientific" Trifles.

In an article in the *Scientific American* for March 27, referring to certain experiments which have recently been made to determine the time required for the transmission of electric signals by telegraph, the following statement occurs: "In a trifle less than sixty seconds, one minute, the signals go to San Francisco and return to Boston, having traveled about six thousand miles." It may be interesting to the readers of the AMERICAN JOURNAL OF MINING to know that the "trifle less" is fifty-nine and one quarter seconds; the total time of transmission, including the delay occasioned by thirteen repeaters, being only about three quarters of one second! The electric current does its work much more rapidly than the *Scientific American* gives it credit for.

Family School Abroad.

Professor HENRI ERNI, for many years a resident of this country, and late chief chemist of the Department of Agriculture at Washington, returns in May to his native city of Zurich, Switzerland, where he intends to devote himself to superintending the education of such American pupils as may be intrusted to his care. The numerous and excellent institutions of learning in Zurich, no less than its lovely scenery and salubrious air, render it one of the best localities that could be chosen for such a purpose; and the long residence and creditable career of Professor ERNI in the United States enable him to appeal to a host of illustrious names as witnesses to his moral and intellectual qualifications for the task he undertakes. His circular contains many interesting details of the proposed plan of instruction; and we advise all persons who may be interested by the brief outline which we have given, to apply to him personally or by letter, addressed to P. O. Box 784, Washington, D. C.

NEW PUBLICATIONS.

THE ANNUAL OF SCIENTIFIC DISCOVERY for 1869 is no improvement upon its predecessors; and this circumstance is the more irritating, since the foregoing volumes of the series left considerable room for improvement. Dr. KNEELAND, the present editor, seems to enjoy a sinecure. The book presents little evidence of having been edited at all. It is a mere scrap-book of cuttings from a few scientific and other periodicals, even the loose and inaccurate paragraphs of the daily newspapers being adopted into its pages with unquestioning trust. Of course such a collection is not without value, as saving the purchaser some trouble with paste and scissors; but as a scrap-book, even, it is far from complete; and as a Year-book, compared with the European publications of that class, it is beneath contempt. In criticising the Annual of last year, we adopted a lenient tone; and the cause of our present severity is the conviction that the time has arrived when a really scientific Year-book should be issued in this country, and that one obstacle in the way of such a measure is the false impression in the public mind that this volume occupies that position. Let some less ambitious title be given to Dr. KNEELAND's easy work, and the field will be open to more industrious and perhaps more competent laborers.

A few instances will suffice to show how little deserved, in the present case, is the name "Annual of Scientific Discovery." On page 31, under the head of Hardening Steel, it is said that mercury "has no other property than that of being cold (which means nothing) and of producing a hardness which can be obtained with water at the same temperature"—which is intelligible enough, but not true. Mercury, being a better conductor of heat than water, cools steel more rapidly, and in that respect hardens it better than water. On page 78, a musty cargo of ancient wisdom on the subject of the lime light is unloaded as "just arrived." The trick is stale in tea and dry goods; but its application to science is, we trust, novel. On page 85 it is repeated, the first of the "new lamps" there described being a very old one. Our juvenile study of the story of Aladdin leads us to distrust these venerable persons who go about crying "old lamps for new!"

On page 100, in a recipe for liquid glue, a typographical blunder which has gone the rounds of the newspapers, is respectfully adopted, and the reader is requested to mix, among other ingredients, hydrochloric acid and *sulphate* of zinc. "This compound," we are told, "does not gelatinize." We should think not! The lively development of sulphuretted hydrogen following such a procedure would scarcely gelatinize anything but the nose of the operator. We hope next year's Annual will record the scientific discovery that the *sulphate* of zinc is much better for liquid glue than the sulphide. The "new" recipe for water-proof glue, on page 101, we can heartily endorse. It has stood the test of a good many generations, as may be seen by inspecting almost any ancient volume on technology.

On page 155, an inferior French barometrograph is described at some length, without any allusion to the very simple and ingenious apparatus invented by Prof. HOUGH, of Albany. Probably the latter, which is not now very new, will attain sufficient age in the course of five years more to deserve a notice in the Annual.

On page 228 there are a few paragraphs of "cheap and popular information" concerning the process of combustion. We do not know Dr. KNEELAND's age, but estimating it roughly at a hundred years, we can safely say that the discovery here recorded (with the single exception of the use of the term heat-units) was made when he was in his prime.

These and many other illustrations which could be given show careless editing—a deficiency which is also indicated by the slovenly classification of the whole work. Dr. KNEELAND's preface proves that he could do better if he would. A full index, and a fine portrait of Prof. J. D. DANA, together with much scattered information of real value, partially redeem the book.

ANSWERS TO CORRESPONDENTS.

J. L. C., OF PA.—We consider that the "precise instant" when a gun receives the recoil of the explosion, is the whole period of time from the ignition of the powder until the ball or wadding leaves the muzzle. The gun suffers the same pressure backward as the ball forward; and if the gun had the same weight as the ball, and were not attached to the ground, it would fly with the same velocity backward; that is, both the gun and the ball would receive half the velocity of the ball alone, is the case of an immovable gun. The notion that the air fails back to fill up a vacuum created by the exploded gunpowder, and thus partly causes the recoil, is not sound. There is no vacuum formed; and the rush of air into the barrel, by virtue of its greater density compared with the heated and expanded gases of the explosion, has little or no actual effect on the recoil.

F. P. H., OF MASS.—We know of many "water-proof glues" for uniting wood. Many recipes are published for such glue, and it is easy to add to a dissolved substance an ingredient which will, when once dry, prevent it from dissolving again. Bichromate of potash is such an ingredient; but when this is used, the glue should be exposed to light, which will make it totally insoluble. The addition of white lead ground in oil to the watery glue solution, making an emulsion by means of borax or ammonia, is another prescription; likewise, the addition of a solution of rubber in benzole, etc. Paris white, zinc white, or white lead, all in very fine powder, diminish to a certain extent the solubility of the glue.

L. V. G., OF OHIO.—For an ordinary foot-lathe for wood and light metal work, an iron wheel—20 to 30 inches in diameter, and weighing 50 pounds, or more—is sufficient for a driver. A wheel of 175 pounds is not objectionable, but unnecessary. The spindle should run in steel; steel on steel is found much better than the old notion of running in brass or Babbit metal.

W. Y., OF MO.—COOLEYS' recipes are not always perfectly reliable. The so-called "Diamond cement," imported from England, you can easily make yourself. It is nothing but shellac or mastic dissolved in alcohol or turpentine, to which sometimes gum ammoniac and a solution of glue in water is added.

C. C. L., OF OHIO—Sends us a sketch of a portion of the common hot water boiler usually placed in dwellings in connection with ranges and furnaces. He does not understand the necessity for the supplementary pipe connecting the hot water draw off pipe above the boiler with the cold water delivery pipe at the bottom. He is right; in some boilers this supplementary pipe is omitted. When the circulation is perfect, the boiler is safe enough. It requires no safety-valve, as the water is not enclosed in it, but only under the pressure of the water supply of the locality, and in the worst case can be driven out of the boiler, which is the only danger resulting from choking up of the tubes.

E. T. F., OF ME.—When you apply glycerine to your butter-tubs, be sure that the glycerine is free from lead. Glycerine often contains lead, though not so constantly the case now as formerly, when it was always made by decomposing fats with lead oxides. Also, take care not to put too much glycerine on, as it gives a disagreeable sweetish taste to the butter. Buy it at the druggists only when you want a small quantity of a very clear, pure article. For the use you speak of, the yellow glycerine of much lower price is good enough.

H. A. S., OF ME.—Says he saw about two years ago a statement of the erection of a flour mill in New York to hull the wheat before grinding, and asks "What became of it, and why don't the owners advertise?" Because the process is a failure. Hulling is practicable when the interior of the grain is harder than the exterior, as is the case with barley; but it is not applicable to wheat, the interior of which is very soft, and the shell hard.

J. O. B., OF IND.—Wishes to know a practical method of scouring oil containing petroleum out of cloth or yarns. As petroleum is not a compound of fatty acids, it is not saponifiable with alkalies, and therefore alkalies or soaps, which so easily combine with and thus remove grease, will not affect petroleum. The only solvent which at present occurs to us is benzine; this will often remove petroleum spots not affected by other agents.

T. N. S., OF N. Y.—To blue gun-barrels or pieces of steel, they should be first made bright, and then heated with excess of air to about 540 deg. Fahr., when a film of oxide is formed on the surface, which, at about 460 deg. is of pale yellow straw color; at 480 deg. brown; at 510 deg. pink; and at 540 deg. blue; above this point it becomes greenish, and afterward yellow again, while the steel has lost all its hardness.

A. E. W., OF ILL.—There are some data published on the resilience of springs. They are, however, incomplete. The reason that detailed and full experiments have not been made and published in tabular form is that it would be of little general value, and would bring neither money nor fame to the experimenter.

J. VAN O., OF PA.—To dry chlorine gas, you may use the material employed for most other gases, viz: pumice-stone or gun-cotton, moistened with strong sulphuric acid, which will absorb the water of any gas passing through it. The process is described in almost every text-book of elementary practical chemistry.

C. L. H., OF OHIO.—An aqueous solution of gum arabic, as a varnish for leaves and flowers, cannot resist the least exposure to moisture. You had better use some very diluted turpentine or alcohol varnish: it is infinitely more durable.

Original Papers.

[WRITTEN FOR THE AMERICAN JOURNAL OF MINING.]

SAND: GEOLOGICALLY, CHEMICALLY AND TECHNICALLY CONSIDERED.

BY DR. LEWIS FEUCHTWANGER.

Sand is composed of particles of quartz and silica, which are more or less rounded, are of a white, gray, or grayish red color, and are unquestionably derived originally from a compact rock, called the sandstone formation. Sand may, however, be granitic, containing particles of felspar. This is the case when it has not been exposed to atmospheric agents long enough to decompose it. Sand consisting of angular grains, is mostly employed for mortar or building purposes. The rock called sandstone is made up of agglutinated sand or pebbles and fragments of the same. It may be a siliceous, granitic, porphyritic, basaltic or calcareous sandstone, according to the material which occurs with it in nature; and it may be a compact, friable, ferruginous or concretionary sandstone, according to its structure. Again, if the sandstone glistens with scales of mica, it is called a micaceous sandstone; if much clay is mixed with the sand, it is called an argillaceous sandstone; and if this contains lime, it is called marly sandstone. If the quartz or sand pebbles are rounded, and are held together in a conglomerate, the result is called a pudding-stone; and if they are angular, a breccia.

The flexible sandstone, or itacolumite is a schistose quartz rock.

Buhrstone is a cellular silicious rock.

The millstone, or gritrock, is composed of siliceous pebbles.

Siliceous schist is a flinty quartz rock.

Jasper rock is likewise a flinty siliceous rock.

Obsidian volcanic glass, or pumice stone, pitch-stone, pearlstone, are all silicious or sandy rocks, having a volcanic origin.

Sand, if transparent, bears the name of quartz, the constituent of a great many rocks, of both the primitive and newer formations. Quartz crystallizes in six sided prisms, with no apparent cleavage, of all degrees of transparency and opacity, and of all colors, from white and yellow green to black, with intermediate amethystine, rose and smoky tints. Pure pellucid quartz is called rock crystal, or pure silica.

Quartz is infusible before the blow-pipe, but when heated with soda, fuses easily to a glass. If quartz has colored bands it is called agate, and if without bands or clouds it is chalcedony. When massive, of dark and dull color, with translucent edges, it is called flint; if with a splintery fracture it is hornstone, like the Arkansas whetstone. When it is still more opaque or black, it is the Lydian stone or basanite; if of a dull red, yellow or brown color, and opaque, it is jasper; when in aggregated grains it is called quartzite, and when in loose incoherent grains it is the ordinary sand, which is frequently transparent. Sandstone belongs to all ages, from the lower Silurian to the most recent period, but the azoic rocks, which are nearly all crystalline, contain some sandstones; and the metamorphic, which are the most ancient rocks, and comprise granite, gneiss and syenite, consist largely of quartz. Certain dark red sandstone are known as the freestone of New Jersey and Connecticut, and the general term new red sandstone is applied to this formation, which is more recent than coal, while the old red sandstone lies below the coal, and above the great Laurentian formation. Freestone is an excellent building material; in New York it is used more than any other stone. Trinity Church, in Broadway, and many other public and private buildings, serve as examples; also, the greater part of the flagstones which are brought to this city from Connecticut.

The green sand of New Jersey, which has for the last 30 years enhanced the agricultural prosperity of the lands of that State, and which belongs to the cretaceous formation, is a sandstone containing iron and potash.

As already stated, sand and quartz are pure silica; still there is no mineral that assumes so many forms and colors as quartz, though none is more easily distinguished. Its characteristic features are:

1. Its hardness, which is from 6.5 to 7, enabling it to scratch glass with facility.

2. Its infusibility; when heated alone before the blow-pipe it does not melt.

3. Its insolubility, as it is not, like limestone, attacked by the strong mineral acids.

4. Its want of cleavage, which has been mentioned above. This is one of the first characteristics of quartz.

5. Its crystalline character, occurring mostly in six-sided prisms, more or less modified and terminated.

6. Its low specific gravity of 2.5 to 2.7, is an unfailing distinctive character of quartz.

Rock crystal is a pure pellucid quartz, and was known by the ancients under the name of *crystallos*, meaning ice. It is used for optical instruments, spectacle glasses, and cut with facets, for jewelry. The crystals are often called real California diamonds. In ancient times it was cut into cups and vases, and it is said that on hearing of his final overthrow, Nero dashed into pieces a cup which was worth $3,000. To this class of quartz belongs the finest ornaments which adorn the palaces of ancient and modern times; and some forms, such as amethyst, rose quartz, *false topaz*, *smoky quartz*, known as Scotch pebbles, or cairngorm, the favorite ornaments of the sportsmen of the Highlands, are used as jewels.

Milky quartz, or greasy quartz.

Prase is of leek green color.

Avanturine, more commonly known as gold-stone, is a quartz spangled throughout with scales of golden yellow mica, although the artificial imitation looks more beautiful than natural stone.

Chalcedony is a translucent variety of quartz, which often lines the cavities of other rocks, in the form of stalactites, which are then called icicles of chalcedony, and forming grottos several feet in diameter. We find such in the Faroe Islands, in Florida, and in many volcanic rocks, probably owing to silicious waters filtering at some period through the rock, and deposited by their concentration. Chrysoprase is but an apple green chalcedony.

The *carnelian* is a bright red chalcedony, of a clear, rich, flesh-colored tint; it is a great favorite of the Japanese.

The *sard* is a deep brownish red chalcedony.

Agate is a variegated chalcedony, and its colors are distributed in clouds, spots or consecutive lines, which may be straight, circular or zigzag forms. When the outlines are angular, resembling a fortification, it is called a fortification agate; if dendritic or moss-like delineations, arising from disseminated oxide of iron, it is called mocha stone or moss agate. The color of agate is much darkened by boiling the stone in oil, and then dropping it into sulphuric acid; a little oil is absorbed by some of the layers and the acid blackens or chars it.

The *onyx* is an agate, where the colors are arranged in flat horizontal layers, formed usually of light clear brown and an opaque white. When this stone is a sard and white chalcedony in alternate layers, it is called sardonyx.

The antique cameos and sculptured small ornaments from onyx are well known, such as the Mantuan vase, at Brunswick, 7 inches high and 2 1-2 inches bread, representing a cream pot, and cut from a single stone; having white and yellow groups of raised figures, representing Ceres and Triptolemus in search of Proserpine.

The cat's eye is a greenish gray translucent chalcedony, having an opalescence or reflection, like the eye of a cat, when cut with a spheroidal surface, probably owing to filaments of asbestos.

The jasper is a dull red silicious rock, containing some clay, and yellow or red oxide of iron, and has all the varieties of riband, Egyptian, resin and porcelain, all assuming a high lustre and polish.

Bloodstone or heliotrope, is of a deep green color, slightly translucent, and containing red spots, resembling red drops of blood; many superstitious people have attached much importance to these red spots, and a bust of Christ in the Paris museum represents quite natural blood drops.

The Lydian, or touch-stone, is a velvet black silicious stone, or flinty jasper, which is used on account of its hardness and black color for trying the purity of the precious metals. This is done by comparing the color of the tracing left on it with that of an alloy of known character.

Petrified wood, called also silicified wood, containing the texture of the original wood, which when sawn across and polished is remarkably beautiful.

Quartz crystals are often found enclosed with other minerals, such as rutile, asbestos, actinolite and topaz, oxide of iron, tourmaline, chlorite and anthracite coal; those containing the rutile look as if needles or fine hairs passed through them in every direction, and when cut for jewelry, pass by the name of love's arrows, or *fleches d'amour*.

The *opal*, one of the most fashionable jewels, is silica, with some water; it exhibits internal reflections of rainbow colors, and forms a gem of rare beauty; it is usually cut with a convex surface. Among the varieties of opal are fire-opal or girasol, it has yellow, bright hyacinth, or fire-red reflections. The common or semi-opal, has a milky opalescence, but does not reflect a play of colors.

Hydrophane, cacholong, hyalite, menilite, wood opal, jasper, silicious sinter, pearl sinter and fabasheer, all belong to the same class of silicious minerals, and are of greater interest to the mineralogist than to the general reader.

[TO BE CONTINUED.]

AMERICAN INSTITUTE.

Proceedings of the Polytechnic Association.

PROF. S. D. TILLMAN, IN THE CHAIR.

NEW YORK, March 25, 1869.

SUSPENSION BRIDGES.

The chairman exhibited a small section of the wire ropes forming the cable of the new suspension bridge at Niagara Falls. The specimen had been presented to the association by Mr. McAlpine. This bridge has the longest span of any suspension bridge yet constructed. The cable consisted of forty-nine strands of the rope, of which a specimen was shown.

Dr. PARMELEE.—This bridge has now been open for three months and answers admirably the purpose for which it was erected. A curious fact connected with this bridge is, that the ordinary difference of temperature occurring during our seasons, causes an elevation or depression of nearly three feet in the roadway. That is to say, during cold weather, the roadway is three feet higher than it is during very warm weather.

Some one asked if the rope was iron or steel? The reply was—Iron.

Mr. FISHER.—Iron is better than steel for such purposes. Iron is more ductile than steel. The most important property of the wire is its elasticity, whereby the wires expand, and thus every one of the wires is made to bear its share of the strain.

Dr. FEUCHTWANGER.—Iron is better than steel. Iron elongates a little.

Mr. FISHER.—If twisted too much the cable will not be so strong.

THE CHAIR.—In some cables the central wires are straight, and the outer layers of wire are laid spirally around them.

Dr. EDWARDS.—This system would not be so good—the twist gives elasticity.

LETER AND ENVELOPE MADE OF SHEET IRON.

The chairman exhibited a letter which had been recently received, which was written on sheet iron and enclosed in a sheet iron envelope. There is nothing very new about this, as similar letters have been exhibited before the Institute on former occasions.

[Careful measurement with a reliable micrometer, shows the thickness of the sheet iron composing this letter, to be 1-500 of an inch.—REPORTER.]

Dr. VANDER WEYDE.—A volume, of which the leaves were sheet iron, was exhibited at the exhibition in London. It contained 300 leaves and was one inch thick. It was printed, and the printing was accomplished by the use of elastic type, made of the same material that is used for the inking rollers of printing presses.

Mr. JOHNSON.—These sheets were probably rolled out, two or three together, that is, a pile of two or three laid one on top of the other was probably passed through the rolling mill at once.

Dr. FEUCHTWANGER.—That is the way in which tin-foil is made, or rather it is more frequently rolled between large plates, but then tin-foil is much softer than iron.

NEW RAIL—CARBONIZING.

Mr. FERGUSON exhibited a rail of peculiar construction. It was so made as to allow of four edges being used in succession, by simply turning the rail over and reversing it. The rail was made of wrought iron which was then carbonized to a depth of one-eighth to three-eighths of an inch.

Dr. PARMELEE, after some inquiries in regard to the methods used for carbonizing the rails said: There is no known method by which iron can be carbonized, except by cementation. All the plans for plunging, etc., are more humbugs. It is true that by various processes of case-hardening the surface can be rendered hard, but then it takes eight hours to penetrate 1-16th of an inch, and after that depth has been reached the process becomes still slower.

In reply to a question by Mr. FISHER, Mr. FERGUSON stated that it cost $40 per ton to carbonize the rails.

Mr. FISHER.—This makes the rail altogether too expensive. Besides, that if you take away the central ribs you have nothing left except the old English rail.

Mr. FERGUSON.—Yes, and if you take away the top and bottom of the rail you won't have anything left at all. You cannot turn the old English rail over and then reverse it and so utilize all th

four edges, and it is well known that it is the inner edges of the rail that suffer most severely as they come in contact with the tread of the wheel.

Dr. Vander Weyde.—It is a curious fact that all those substances which are best for case-hardening, contain nitrogen. One of the best substances for this purpose is prussiate of pottassa; a little of this sprinkled on a piece of iron carbonizes the surface instantly.

Dr. Parmelee.—Yes, but the iron is carbonized to such a slight depth that it is good for nothing where there is much wear.

The Chairman presented the following notes on Scientific progress:

ON THE FUMING OF CERTAIN ACIDS.

Mr. C. Tomlinson answers an inquiry in The London *Chemical News:* "Why Hydrochloric Acid fumes when let out into the air, while ammonia, which has a much stronger affinity for water does not?" From his communication we extract the following: "I took the specific gravity of the solution of ammonia and found it to be 0.889. Twenty-four drachms of this were put into a flask, and heated over a spirit lamp. It at once entered into quick ebullition, and there was a great head of gas bubbles from which very large bubbles expanded and burst. The thermometer rose slowly to 100 deg. F. When the lamp was removed the boiling ceased instantly, but two or three rapid streams of small gas bubbles continued to be discharged for some time from black specks in the glass which acted as nuclei. When the temperature was at 160 degrees the lamp was removed, and the solution left to cool It smelt of ammonia; the lamp was replaced, and no gas bubbles were given off until the temperature had again risen to about 160 deg. The appearance of ebullition was less marked than before, and the temperature rose to 208 deg., at which it became stationary (Barometer 28.69) inches. When cold, only 10 drachms remained of the 24. The specific gravity was now 0.997. The liquid had a faint smell of ammonia, and a slight action on tumeric paper; but on putting the glass in another room, where the liquid could not re-absorb the ammonia, it lost in the course of a few hours all smell; it had no action on tumeric paper; it was, in fact, brought back to pure water. If a similar experiment be made with a strong solution of hydrochloric acid, it will be found impossible to boil away all, or nearly all the acid gas. If we operate on the acid solution of the specific gravity of 2-21, it will part with gas until it has a density of 1-10, (at 60 deg.) when it will have a boiling point of 233 deg. F., and will distil unchanged. We see then, that, ammoniacal gas and hydrochloric acid gas are greedily absorbed by water, there must be some important differences in the constitution of the respective solutions. We have seen the alkaline solution is much lighter than its own bulk of water; the acid solution much heavier: that the presence of ammoniacal gas in water lowers its boiling point, while the presence of hydrochloric acid in water has a contrary effect. Hence the mode of combination between ammonia and water must be different from that between hydrochloric acid and water. The one must be a case of simple adhesion, the other of true chemical combination as well as adhesion. Ammonia let out into moist air simply adheres to the moisture, and increases its volume. Vapor of alcohol, ether etc., does the same. Now any amount of aqueous vapor that the air can maintain in an invisible elastic state, at a given temperature, it can maintain with increased effect in the case of ammonia vapor, alcohol vapor, etc. Hence the combination of these vapors with the moisture of the air is necessarily an invisible compound. Hydrochloric acid gas, on the other hand, let out into the air, combines chemically with the moisture, producing condensation and diminution of bulk. Hence the compound is visible just as the condensation of pure steam in air produces visible vapor. Fuming nitric acid and Nordhausen sulphuric acid are also cases in point. Concentrated nitric acid exposed to the air absorbs moisture until it attains the density of 1.424, when it distils unaltered at a boiling point of 250 deg."

Dr. Feuchtwanger.—The cause of this may lie in the fact, that hydrochloric acid contains but one equivalent of hydrogen, while ammonia contains three equivalents.

Dr. Vander Weyde.—I think it will be found that the affinity of hydrochloric acid for water is much stronger than that of ammonia for water. When we distil hydrochloric acid gas, we have to be very careful that a drop of water does not get in, for if it did it would absorb all the gas present with such a shock as would almost blow up the apparatus.

IRON REFINED WITHOUT PUDDLING.

A new process of refining iron by the mechanical admixture of oxides of iron with the melted crude metal is now in practical operation at the Schœuberger Juniata Works in Pittsburgh. The melted metal is run direct from the blast furnace into the large kettle having a capacity of five tons; from thence it is poured in a stream into a revolving circular trough about 12 inches wide and 10 inches deep, the diameter of the whole being about 14 feet. As fast as the metal is poured in the pulverized ore descends from a hopper, thus, as the trough revolves, alternate thin layers of melted metal and raw ore are made which combine in a very satisfactory manner. The machinery used in this operation is managed by one man. When the trough is full, the metal, before it has cooled, is broken up into slabs of suitable size for the heating furnace. This is said to be the most important improvement in iron making introduced in many years.

Dr. Parmelee.—This is in fact the earliest process known for making iron—the process adopted by the old Hindoos. By this process a pure fine iron is obtained, but the difficulty is that your slag will be so rich in iron that it will pay you to erect a blast furnace by the side of your other works, for you will in fact have an ore-bed of very rich ore on your premises, that ore being the slag which will contain from 50 to 60 per cent. of pure iron.

Dr. Feuchtwanger.—I have supplied the parties with large quantities of nitrate of soda and manganese, and they all seem to be very well pleased with it.

Dr. Parmelee.—That they turn out first rate iron, and that they purchase manganese and nitrate of soda in large quantities, I have no doubt; but I very much doubt the statement that they make it pay.

Dr. Vander Weyde illustrated on the black board the chemical reactions which occurred.

Dr. Parmelee.—That by these means you can get rid of all the uncombined carbon, I have no doubt—but that you can get of the last portion of carbon—that which is *combined* with the iron, I utterly deny. I have seen it tried over and over again without success.

NEW TIN MINES.

The great value of the tin workings at Junk, Ceylon, said to be not less than 150,000 tons per annum, have incited a Chinese merchant to propose the development of the tin district at the Isthmus of Kra in Siam. He is to have the government of the district to enable him to carry out his designs. As the river Kra is the boundary between British Burmah and Siam, it is probable that the product of these tin mines will be carried to England.

Dr. Feuchtwanger.—The tin mines of Mexico prove to be very rich.

PREPARATION OF NITROGEN.

An Italian chemist, Mr. Massino Levy, has devised an admirable method for preparing nitrogen gas. It consists in heating bichromate of ammonia in a retort, when the salt is transformed into the green sesqui-oxide of chromium, the remaining oxygen having united with hydrogen of the ammonia forms water while the nitrogen of the ammonia on being isolated assumes its natural state as a gas. A good deal of random discussion followed the reading of this note but no very definite conclusion was reached.

NEW GREEN PIGMENT.

Among the substitutes proposed for the dangerous green containing arsenic is that produced by M. Moulin. He mixes 100 parts of a hot solution of zinc in hydrochloric acid with from one to fifteen parts of a hot solution of the oxide of cobalt in hydrochloric acid—the proportion being varied according to the shade of color required. A solution of carbonate of soda is then added to the mixture, when a precipitate of the mixed hydrated carbonates of zinc and cobalt is formed. The chlorine in the first mixture unites with sodium in the carbonate solution, forming common salt, which is removed from the precipitate by washing it with a large quantity of water. The precipitate is then dried on chalk or gypsum plates, and subsequently heated to at least 1,000° C., when it assumes a yellow color, but on cooling it becomes green. By using sulphate of alumina in place of a portion of the zinc in the first mixture, a bluish tinge may be given to the pigment.

COTTON WASTE AS A MANURE.

A French cotton spinner has used his cotton waste for the last ten years for seed beds and early crops. He mixes the waste with stable manure, and thus claims to avoid the burning and chills which manure alone often causes. The waste applied to an asparagus bed in a layer about 8 inches thick was found to protect it from snow, and to so hasten the growth of the plant that tender and well flavored asparagus had been gathered in the midst of winter. It was pretty generally thought that cotton waste is too valuable to be used as manure.

OMNIMETER.

This name is given to a new and ingenious instrument designed by M. Eckold. It is used in measuring distances, altitudes, and angles. It consists: 1. Of a graduated circle to read off each ten seconds in the measurment of horizontal angles. 2. Of a powerful telescope revolving in a plane perpendicular to the graduated circle. 3. Of a microscope of high powers, connected with telescope and moving with it. 4. Of a highly sensitive level lying upon a rule of a fixed length, say 20 centimeters. 5. Of a scale fixed vertically at the extremities of the rule at a distance coincident with the optical axis of the microscope, which scale is divided into half millimeters from 1 to 200. 6. Of a microscopical screw movement connected with the base of the scale, and giving the two ten-thousandths of a millimeter, legible on the graduated scale beneath; and 7. of an extremely sensitive level capable of being applied to the telescope and of determining, when required, its horizontal adjustment. The leveling staff used with the Omnimeter is not devided, but is of an invariable length, which is defined by two white lines on a black ground, one at the upper end and the other at the lower extremity. The Omnimeter is found especially useful in difficult and hilly ground where leveling in the ordinary way becomes a tedious operation, because the sights are short and are multiplied in proportion to the rapidity of the incline. With the new instrument the levels may be taken at much greater distances apart, even where considerable angles are made with the horizon. The Omnimeter embraces all the advantages of the theodolite and level, and does away with tedious chain measurements; furthermore, its operation requires no complicated calculations.

Mr. Stetson.—A cheap and simple instrument for measuring distances is a want that is widely felt. Some years ago a Mr. Crandall, of Western New York, invented an instrument for measuring distances, which did the work very well. The principle consisted in taking a fixed base, very short—say one foot—and attaching to each end a telescope, which turned on a pivot, and carred an index moving near a graduated arc. By fixing the instrument, and then directing the telescope to the object, the angles at the base of the triangle thus formed were measured, and the distance easily calculated. But in this case it was not necessary to *calculate* the distance, for instead of having angles marked on the scale the distances themselves were marked off so as to be easily read. This instrument was tried and found to work well for all moderate distances. It was even tried at distances of fifteen miles, and found to give tolerably accurate results. But it fell out of use and I have not seen one in a long time.

The Chairman made a diagram on the board, and explained the principle upon which the instrument described by Mr. Stetson must have worked.

A gentleman present remarked that he had no faith in such instruments applied to the measurement of such great distances. The base is so short that the slightest change produced by heat or moisture will vitiate the result to such an extent as to render them worthless.

Mr. Stetson.—That brings to my mind the fact that there is a great want in this direction. Now, it has been said that in this country of ingenious inventors a want properly announced is half supplied. I wish some of our inventors would get up a material which would be unchanged by heat or cold, moisture or dryness. Wood comes nearest to this of anything we know. All other bodies are easily changed in size by the action of heat. I remember the time when Whitworth, who was known at that time more as a manufacturer of fine tools than an inventor of rifles, had one of his micrometers in this city. One part of the instrument consisted of a small piece of steel which passed between two surfaces and indicated the distance between them. When this piece of steel was cool it would drop in very freely, but the merest touch with the fingers would expand it so that it would stick and no longer fall down.

Dr. Parmalee made a diagram of the well-known walking figures, which are propelled by means of alternate expansion and contraction. He then called Mr. Stetson's attention to it as an evidence that wood is not so unchangable after all.

Mr. Fisher.—This subject is of great importance in regard to the scale used by draughtsmen. If the scale expands and contracts we can never make two measurements alike. Wood scales are tolerably constant, but ivory scales, though much finer, are nearly worthless.

Mr. Richards.—It occurs to me that as wood is changeable chiefly on account of its hygroscopic properties the best way to get a perfectly unchangeable substance would be to use charcoal. Scales made of charcoal could not alter.

Mr. Phin.—Why go to the trouble of getting up a special material for scales, when a scale, no matter how accurately it may be made, nor of what unchangeable material it may be constructed, can be used only to take measurements from the very changeable substance on which the drawing is made, viz., paper? Would not a better way be to lay the scale down on the drawing itself. Then whatever change occurred in the drawing would occur in the scale too, and thus their relative proportions would remain the same.

Mr. Fisher.—We have all seen these scales. They are used by draughtsmen simply because they are cheap. A paper scale costs a few cents, while a proper scale is quite expensive.

Mr. Phin.—I had no intention of alluding to the chart scale mentioned by Mr. Fisher. I referred to accurately constructed scales laid down by the draughtsman himself on the very paper on which the drawing is made, so that whatever changes occur in the one may occur in the other also.

Dr. Vander Weyde.—We all know that paper is very hygroscopic. The Doctor here made a diagram on the blackboard, and observed that paper arranged in this way formed a very good hygrometer.

Dr. Parmalee.—We have all seen collars coated with a paste made of baryta, bleached shellac and some other substances. Such collars resist moisture perfectly. Why would they not resist hygroscopic influences?

Mr. Stetson suggested that charcoal might be coated with india rubber.

Dr. Parmelee.—Unfortunately india rubber is one of the most hygroscopic substances we have. Of water, it absorbs nearly 15 per cent. of its own weight.

Dr. Vander Weyde.—I would like to call attention to the method devised by Prof. Plattner for procuring blocks of charcoal of any size. He takes fine charcoal powder, mixes it with flour paste and bakes it. It is then charred, and is ready for use. But charcoal itself is probably very liable to change its volume. We know that it absorbs gases very powerfully, and it is probable that it expands in doing so.

D. Parmelee.—After all, perhaps we had better leave this subject in the hands of the draughtsmen. Their plan of using paper is probably the best.

Mr. Fisher—Paper scales are only used on account of their cheapness.

Mr. Phin—Allow me again to state that I do not refer to scales purchased in the form of small slips of paper. The scale must be laid down on the very paper on which the drawing is made. It will then expand and contract with it.

Dr. Vander Weyde.—It is obvious that as different kinds of paper expand and contract at different rates, the only way to insure accuracy is to use the same paper for both the scale and the drawing.

Prof. G. W. Hough, in his recent report as Director of the Dudley Observatory at Albany, N. Y., gives the conclusions arrived at after a series of experiments with galvanic batteries as follows: 1. In the sulphate of copper batteries (Daniell's form,) the principal cause of the decline in the electric current is due to the formation of the sulphate of zinc. 2. The quantity of electricity flowing in the external circuit depends on the specific gravity of the sulphate of zinc solution. 3. When the sulphate of zinc solution approaches saturation, polarization takes place in the battery itself, and, although electric motive force remains the same, the internal resistance may be increased more than a hundred times. 4. The sulphate of zinc solution (or any fluid about the zinc), is useful only as a conducter of electricity. 5. The copper, or negative metals is useful only as a condutor; since it can be replaced by any negative metal, euen by zinc itself. 6. The internal resistance of the battery has been separated into two parts, viz.: that due to the porous cell and that due to the liquids employed. The specific resistance of the liquids was found to be 13; that for a small clay cell 17, and for a leather cell 7; since the resistance of the leather cell is less than one-half that of a clay ceil, we have used it in the construction of batteries, as the quantity of electricity is nearly doubled, without any increase of the surface. For the negative metal, in place of the copper heretofore employed, we have used sheet lead. The investigations have enabled us to compute with great precision the length of time a battery will generate its normal quantity of electricity, provided the amount of electricity flowing in the external circuit is known, and the capacity of the vessel holding the sulphate of zinc solution is determined. The specific gravity of the sulphate of zinc solution should not be less than 15°, nor more than 30° Baume.

Dr. Bradley had experimented with solutions of sulphate of zinc of various degrees of density and had not found much difference. There was no difference between a solution showing a density of 40° Baume, and one showing 15° Baume.

Mr. Phin.—Sheet lead has long been used for the negative metal in sulphate of copper batteries. In the first work ever published on the electrotype, Mr. Spencer described a battery of great power, in which the negative metal consisted of thin tea lead, crimped or corrugated, so that a great surface might be compressed into a small space. The power of the sulphate of copper battery depends largely on the amount of surface presented by the electro negative element, and Mr. Spencer obtained this increased surface in a very simple and cheap manner. In regard to the cells—clay cells vary very much in the facility with which they conduct the electric current. I have tested them with a galvanometer, and have found that some conduct more than twice as readily as others. Leather cells have been tried, but are inferior to good clay cells. Cells made of paper offer the least resistance of any, but they do not last long, and they allow the sulphate of copper to pass through and attack the zinc.

Dr. Vander Weyde.—I can corroborate what the gentleman has said in regard to the conducting power of clay cells. In some experiments which I made with Mr. Chester, we found that clay cells might conduct electricity too freely and we found an advantage from drawing a line of varnish spirally round the cell, thus diminishing its conducting power.

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CONTENTS.

CHAPTER I. PAGE.

Glance at Pike's Peak prior to the Discovery of Gold; Discovery of Gold on Ralston Creek in 1852, and on Dry Creek in 1858; Effect of the News in the States; Crossing the Plains; Indians; First View of the Mountains; Prospecting, Hunting; Placer Camp; Auraria; Arapahoe County; Election of Delegate to Congress and Representative to Kansas Legislature; Denver Town Company..... 1

CHAPTER II.

Grand Physical Divisions of Colorado; The Snowy Range, The Foot-hills, The Valley, and Over the Range; Characteristics of the Snowy Range, of the Foot-hills; The Great Mineral Belt; Metalliferous Veins; Mode of Occurrence of Gold..... 22

CHAPTER III.

Discoveries of Gold in the Mountains; John H. Gregory and the Gregory Lode; History of Discovery Claim on the Gregory; Placer and Bar Diggings; First Mining Laws; Russell Gulch; Quartz Mining; Gregory District Organized and Code of Laws Adopted..... 59

CHAPTER IV.

Visit of Horace Greeley and Party; Establishment of Newspapers; Attempted Organization of Government; Jefferson Territory; Mail, Passenger, and Express Facilities; Overland Mail; First Winter in the Mines; Quartz Mills; Wagon Roads..... 83

CHAPTER V.

Development of Mining through 1860-1-2-3; Opening Prospects; Immigration and Emigration; Quartz-Mining and Milling; Difficulty in Saving the Gold; Placer Mining; Organization of the Territory of Colorado by Congress; Mining Legislation; Miscellaneous..... 106

CHAPTER VI.

Condition of the Mines at the end of 1863; Transferred to Eastern Capitalists; The April (1864) Panic in Stocks; Temptation to Speculation in Gold Mining; Why the Miners were generally embarrassed at the end of 1863; Why the Eastern Mining Companies have been comparatively unsuccessful..... 131

CHAPTER VII.

Gilpin County; Present Condition of the Improved Lodes; Names of Mining Companies; Amount of Development; Condition of Mines and Mills; Machinery; Processes, &c..... 141

CHAPTER VIII.

Gilpin County continued; Swinging Round the Circle; Independent, South Boulder, Central, Wisconsin Districts, Peck and Missouri Gulches; Their Improved Mines, Mills, Companies, Processes, &c..... 214

CHAPTER IX.

Clear Creek County; General Characteristics; Idaho; Empire; The Mines of Idaho; Spanish Bar; Trail Run; Fall River; Morris and Downieville Districts; Empire Mines; Griffith and Argentine Districts; Discovery, Development, and Richness of the Silver Mines..... 227

CHAPTER X.

Boulder County, Characteristics; Mining Districts, Gold Hill, Ward, Central; Boulder Valley, Boulder City, Valmont; Geology and Topography of the Coal and Iron Region; Belemonte Furnace and Coal Beds; Black Hawk Foundery..... 263

CHAPTER XI.

Park County; South Park; Towns and Mines; Salt Works; Geology; Placer Mining in the Past, in the Present; Beaver Gulch; Tarryall; Crossing the Range in Mid-Winter; Lode Mining in the Past, in the Present; Climate; The Espinosas; The Reynolds Guerrilla Raid..... 280

CHAPTER XII.

Lake County; Its Characteristics, Settlements; Arkansas River; Mining Districts, Westphalian, Pine Creek, La Plata, Georgia Bar, Hope, Lake Falls, Red Mountain, Arkansas, Independent, California, and Sacramento; Approaches..... 306

CHAPTER XIII.

Summit County; Middle Park; Upper Blue River; Ten-mile District; Result of Assays; Work doing; The Snakes; Peru and Montezuma Districts; Lodes and Companies and Improvements Going On; Gulch Mining, Union District, Gold Run and Buffalo Flats; Western Portion of the County..... 321

CHAPTER XIV.

Processes; The Stamp Mill, In Australia, Lake Superior, Copper Mines, California, Nevada, Colorado; Improvements, Keith's Desulphurizer, Crosby & Thompson's, Mason's, Monnier Metallurgical Process; Smelting, James E. Lyon & Co.; Making of Regulus, &c..... 338

CHAPTER XV.

Important Mining Legislation..... 359

CHAPTER XVI.

Geology and Geological History..... 375

CHAPTER XVII.

Agriculture; The Valley, &c..... 416

CHAPTER XVIII.

Recapitulation; Mills and Mining Machinery..... 432

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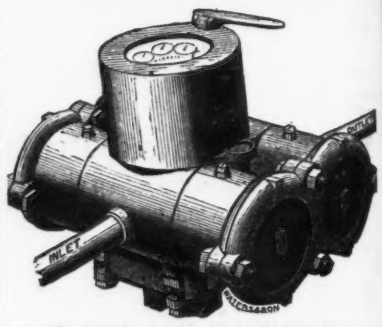

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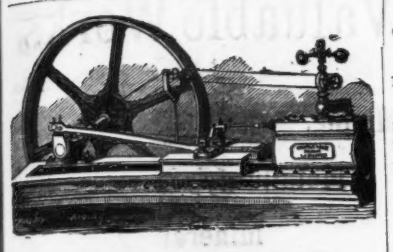

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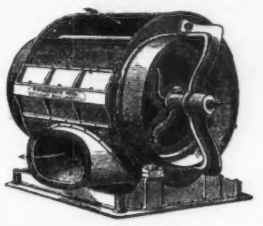

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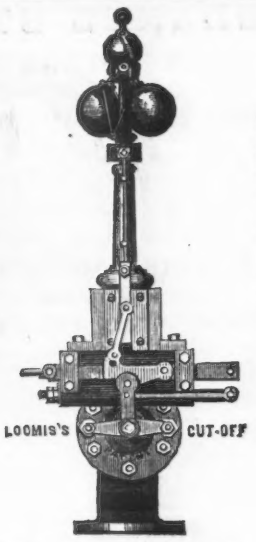

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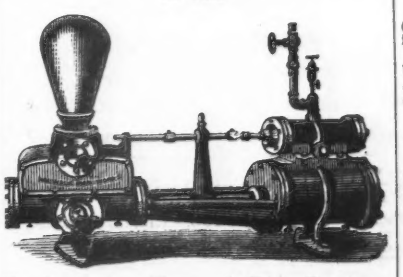

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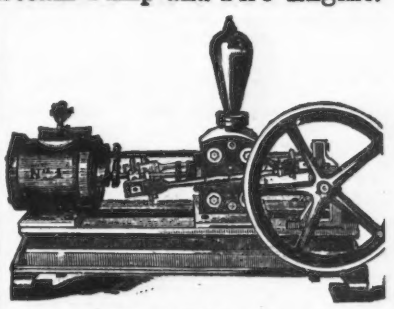

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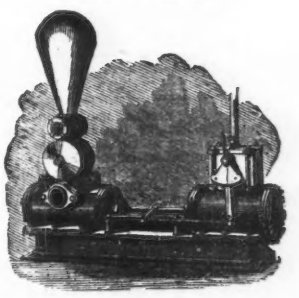

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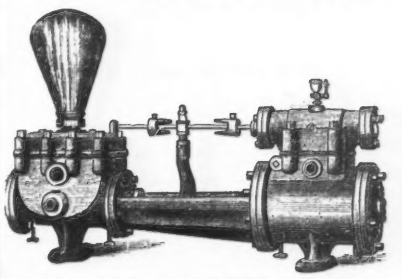

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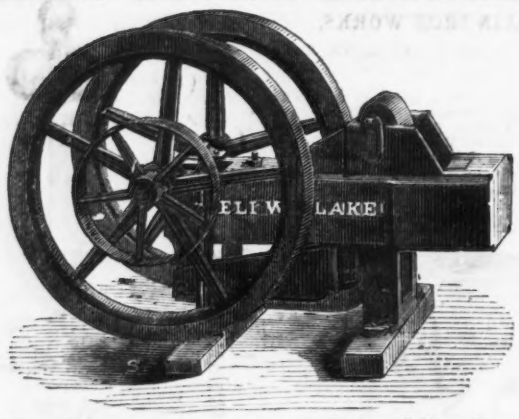

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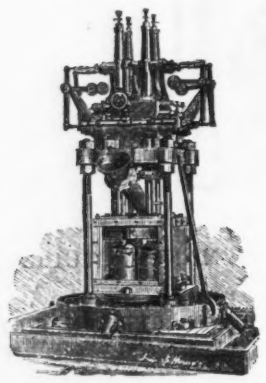

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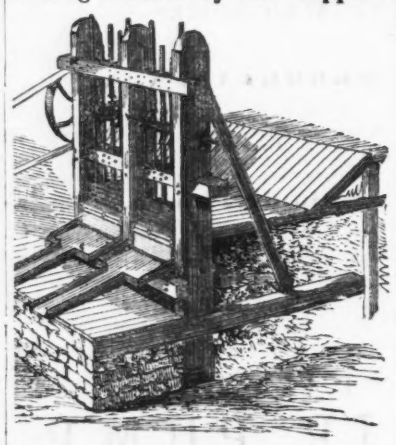

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" One current of (plans)
" One current of, and how to adopt separate currents (plan)
" Dividing of, but not into "separate and distinct" current (plans)
" Crossings (see H on plans)
" Weight of, in shafts
" How to find the weight of
" Table of pressure in shafts
" Expansion of
" Its velocity and force
" Rush of, into each division
" Quantity produced by natural ventilation
" Splitting, why it should be adopted
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Anemometer, measurement of air by, engraving of
Area of a pit, how to find
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Buddle's plan
Circumference of a pit, how to find
Coal, several ways of working it out, and why man methods of working it out are adopted
" Working out in banks (plans)
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" Working out with no regularity (plan)
" Working out by the "end way" or in endings (plan)
Cubical contents of a pit, how to find
Dialing, the mode of
Dials, several engravings
" How constructed
" How fixed in mine surveying
" Needle, its variations
Diameter of shaft
Dip of mine, how to find and lay on plan
Explosion, the power of an
" At Lund-hill, in what part of the mine it was supposed to take place (plan)
" How the power may be diminished
Furnace, how to find the horses power of
" The place of fixing, to produce the largest ventilating current
" Engravings of ground floor, front and back view
" Remarks upon
Gases, (Carbonic acid) composition of
" Do properties of
" (After, or choke damp) composition of
" (Carburetted hydrogen) do
" Choke damp and carbonic acid, not one and the same in quality
" The effect produced on people by inhaling such
" The quantity required for an explosive mixture
" The elasticity of
" The weight of
" The nature and quality of
" Why some mines generate and produce more than others
" Why some mines geenrate a mixture of
Goaf, or gob, how tramrods are made through (plan)
Lund-hill (plan)
Managers, who are best competent to manage mines
Miscellaneous questions
Natural ventilation
Planning, how workings are laid on the plan
Regulators, how to find open space
Regulations (see R on plans)
Safety Lamps, why flame will not penetrate through engraving of
Sections on mechanical ventilation
Summary of accidents
Surveying, how mines are with the dial
Surveying, how mines are with the theodolite
Tables of weights and measures
Temperature on surface
Temperature in mines
Temperature, difference of between down and up-cast
Theodolites for mine surveying
Theodolites, how constructed
Theodolites, the magnetic needle dispensed with, and how workings are laid on plan, with Theodolite surveying
Theodolites, how mines are surveyed with them
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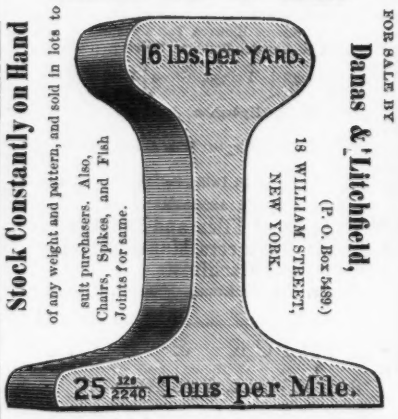

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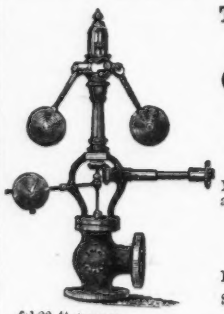

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